THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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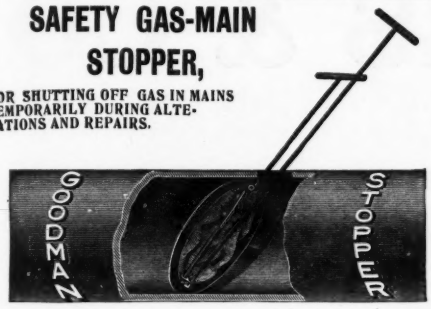

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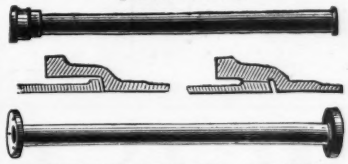

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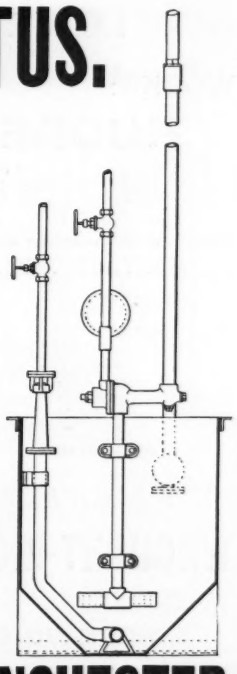

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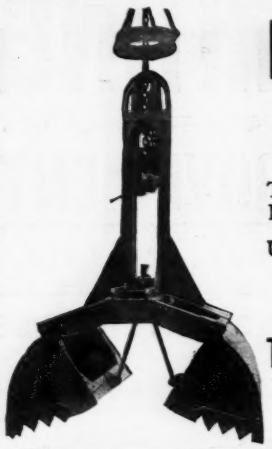

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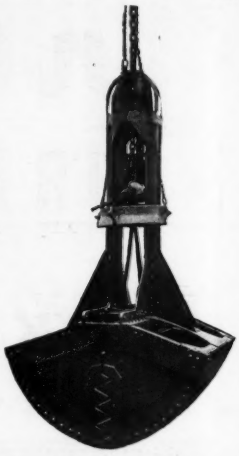

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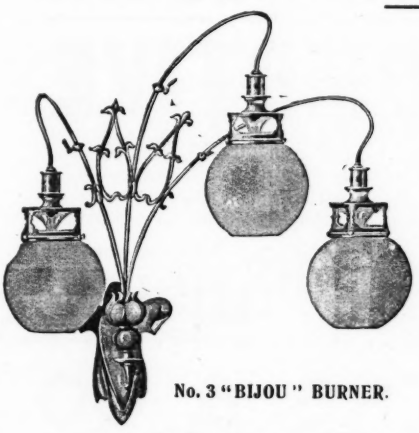

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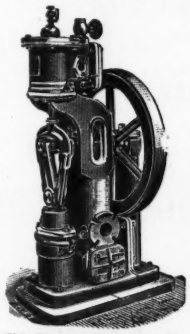

Fig. 705. "SINGLE RAM" STEAM-PUMP.

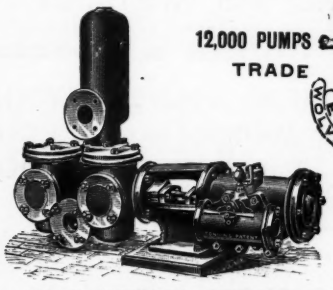

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

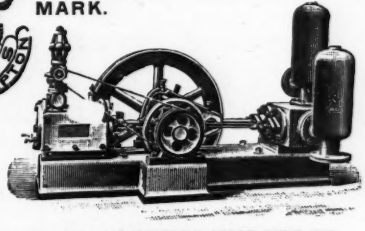

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

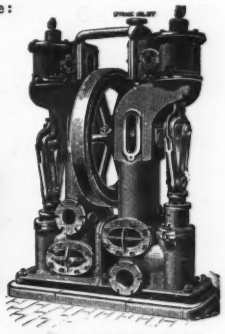

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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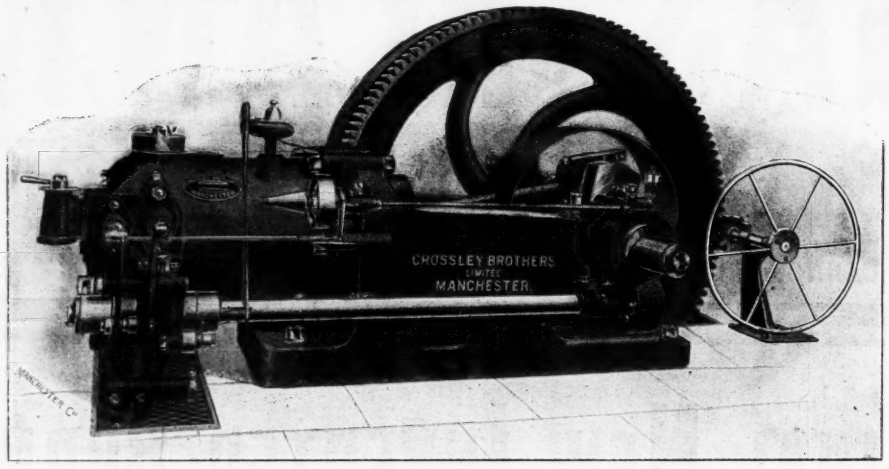

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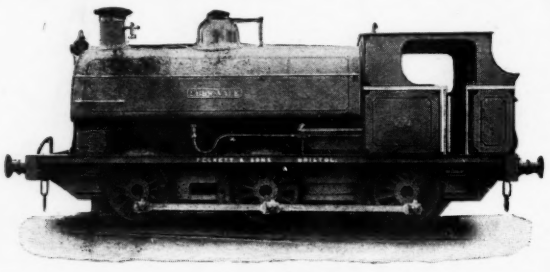

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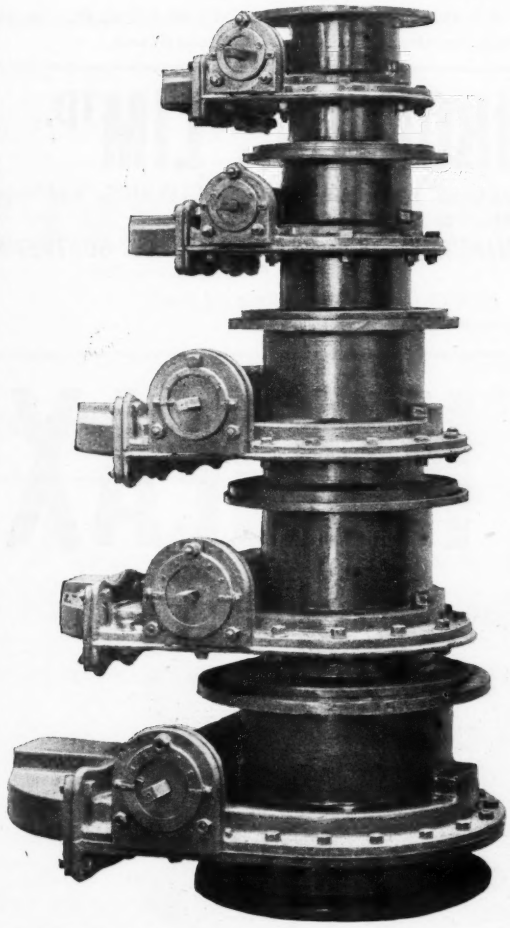

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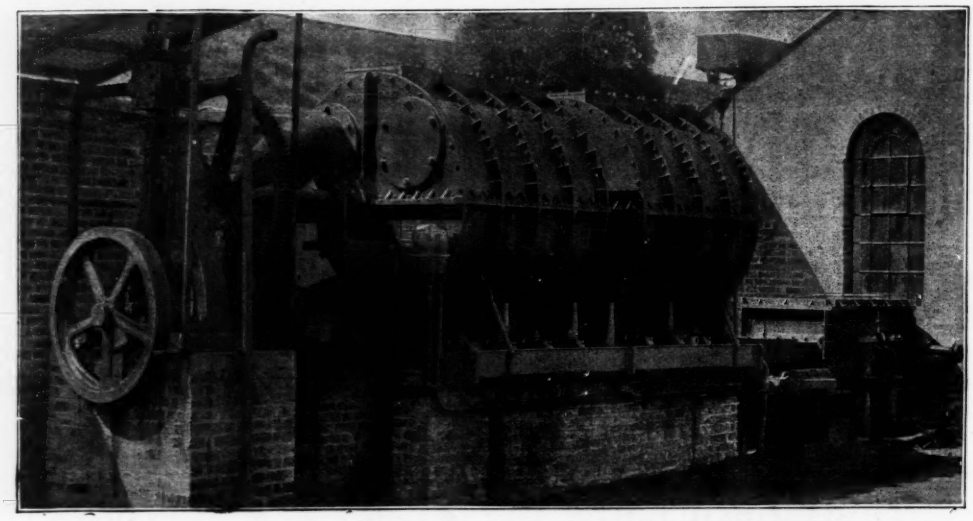

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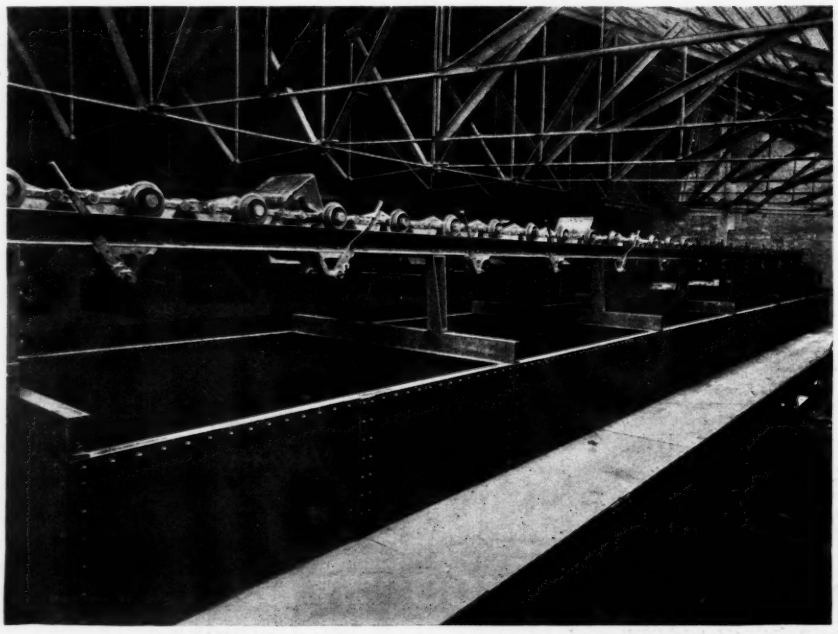

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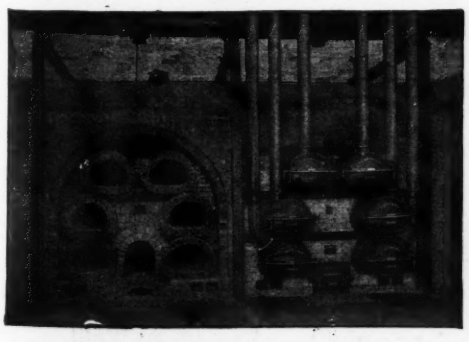

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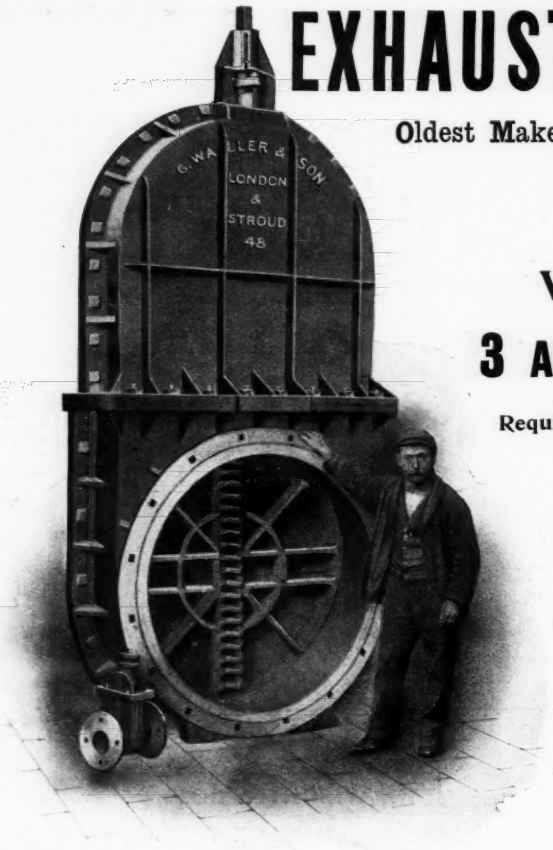

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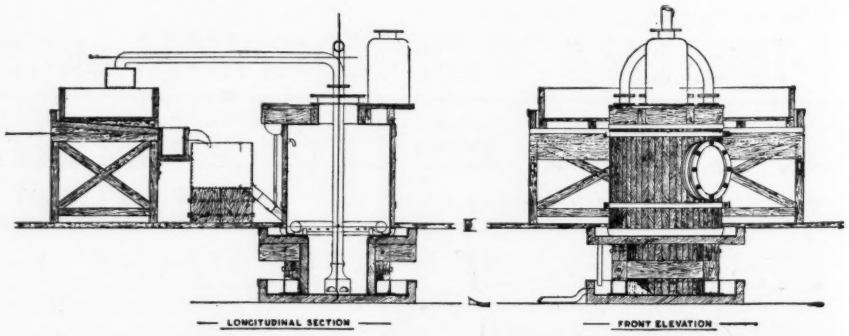

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EDITORIAL NOTES—GAS, &c.

Electric Driving in Gas-Works.

IT is not many years since that the gas engineer would have been found guilty of unpardonable heresy who proposed, and put into practice, the utilization of electricity for driving the mechanical plant in his works. But it is not so nowadays. Circumstances have changed. The extension of mechanical methods in gas-works has transformed and broadened views; and it is now largely accepted among gas engineers that there are mechanical plants the driving of which can be more conveniently performed by electricity than by gas, just as there are other operations requiring motive power that can be more economically achieved by gas-engines than by electric motors. There are several conditions which give one pre-eminence over the other. Gas has been compelled to yield to electricity superiority for traction purposes, and for work where the motive power has to be conducted to great distances and heights, and would with gas or steam engines require a considerable amount of shafting, gearing, &c. In the case of stationary machinery, and where machines can be readily grouped, gas claims to hold its own—and easily—against electricity.

Since electricity has been applied to machines charging and discharging gas-retorts, electricians have gibed at gas engineers for not practising what they preach. But it is the gibe of the ignoramus in gas matters. For such a purpose as the mechanical charging and discharging of retorts, the operating machines have three functions to perform—they have to travel along the charging-floor, their operating parts have to be raised and lowered to suit the varying horizontal levels of the retorts, and the charging and discharging parts have to be propelled into, and withdrawn from, the retorts. With such varied duties, the most convenient motive force has hitherto been compressed air or hydraulic power. In applying electricity for the purpose, therefore, it has not been a question of supplanting gas, but of supplanting competitors of electricity. But in most cases (unless the privilege of very special prices from the town supply can be obtained) it is found more economical on gas-works to generate the electricity required by plant operated by a gas-engine—the generating plant merely taking the place of the compressed air or hydraulic plant, which our electrical friends will admit must be, for the power required, expensive in their installation. As a matter of fact, the combination of the gas-engine and the dynamo, and the use of electrical motors on a gas-works, is a valuable object-lesson to manufacturers and others whose plant is of an isolated and varied character such as is that found in gas-works, where the operations will not allow of grouping as in many factories. But far be it from us to suggest the dismissal of the gas-engine from applications in a gas-works where it can be profitably employed; and no gas engineer would dream of doing such a thing.

The introduction of electricity, however, in connection with the newer types of retort charging and discharging machines has opened up a large question in the economics of mechanical operation in gas-works. When electrical power is installed for one purpose, it is then a consideration whether, for elevating to such heights as coal is required to be carried and then conveyed to the overhead storage hoppers for feeding the charging-machines, it is not more convenient to apply the electrical energy, and so dispense with the shafting and gearing that would otherwise be necessary, and give to the electricity generating plant the advantages accruing from more constant use than would obtain from its single employment for charging and discharging the retorts. Surely electricians will admit that this is economical practice, with a variety of travelling plant—working intermittently and at varying speeds, and, in the case of the ground and overhead coal plant, not concurrently. With the generating plant at hand for retort operation, and with the ready transmission of the energy wherever required by cables, the installation of electric motors for the auxiliary plant, and the maintenance of the motors, may work out cheaper than the installation of special plant and gearing for these auxiliary though important purposes—more especially in view of the distance from each other of the points at which the plant has to be operated.

It is all a question of economy under a combination of exceptional circumstances that do not obtain in possibly a large majority of industrial establishments. But it must still be confessed that the information so far procurable as to the economy has been of a very general nature; and there is room for contributions on the subjects of definite costs—installation, maintenance, and running—and reliability under the varied conditions peculiar to a gas-works. There should be no difficulty in securing experiences now, and we should welcome them, as several gas-works have their own electric plants for the purposes referred to. Hastings has a complete electricity plant, Liverpool has a coal plant operated by electricity, Norwich a coke plant, and many others have electrical installations in connection with their new retort machines. On the Continent, too, under one system only (as an article elsewhere in this issue shows), there are forty different gas-works with installations which practically cover all the mechanical operations of a gas-works. The subject is a real, live one; and we hope supplementary information as to experiences will be forthcoming, more especially, as suggested, on the questions of costs and reliability.

The Nottingham Gas "Crisis."

THE so-called "crisis" in the affairs of the Nottingham Corporation Gas Department, which appears to have been mainly brought about by the resignation of the Chairman of the Gas Committee (Mr. E. Harlow) through what outsiders, on the facts before them, will think is most fitly described as pique, has had a little light thrown upon it by Mr. Harlow himself in a statement he made to the City Council yesterday week. The statement will be read with some amazement by gas engineers and those whose long service in gas administration entitles their views on gas affairs to be received with respect. Mr. Harlow has apparently been misconstruing his position as Chairman of the Gas Committee, and has not given sufficient consideration to the fact that the Committee is not a one-man concern. At all events, that is the feeling which takes possession of one on learning that it was because his "deliberate "judgment" was not allowed to over-ride the presumably "deliberate judgment" of a majority of the Committee that he resigned. The whole trouble is that Mr. Harlow has, for the flimsiest possible reasons, formed the opinion that it would be to the interests of the Nottingham Corporation gas undertaking that their Engineer (Mr. J. H. Brown) should relinquish his position. That is not the equally deliberate view of Sir George Livesey, against whose experience in gas matters and judgment of the fitness of men for responsible official positions in gas undertakings, Mr. Harlow evidently pits his own. This remark may be left to stand without presenting further comparison. In his efforts to get Mr. Brown to resign within the last few months, Mr. Harlow appears, on his own statement, to have personally, and (so far as can be gathered) by no authority of the Committee, pursued him in what, we venture to think, many people will consider has been a somewhat merciless manner to secure his end. We have possibly not heard the last of the story about the conversation that Mr. Harlow reports having had with Mr. Brown on the subject of the promised resignation before the last appointment of Sir George Livesey to investigate the complaints regarding the gas supply. We cannot but think that the late Chairman has made some mistake; for no man would be so foolish as

to make the reception of a report the condition of his resignation, without reference to its contents. But Mr. Harlow says that "some weeks previously he had asked the Engi- "neer to tender his resignation." By what authority the Chairman took upon himself to ask this of Mr. Brown has not transpired. Then Mr. Harlow says that he reminded Mr. Brown "of his promise" to resign on the receipt of Sir George Livesey's report. Was this a fair or wise thing to do, Mr. Harlow knowing then what was contained in that report? Then, again, on the day that Mr. Harlow himself resigned "he proposed from the chair that Mr. Brown be "requested to forthwith tender his resignation." In every way, from these statements, Mr. Harlow seems to have been consumed with a desire to get rid of Mr. Brown, even prior to the report of Sir George Livesey. It is distinctly a case of Mr. Harlow's inexpert investigation against an expert one; and it is patent that a majority of the Committee properly decline, under the circumstances, to be parties to any such arbitrary proposition as that which was advanced by the Chairman. In view of this, it may be repeated, by what right had the Chairman previously asked Mr. Brown to resign?

There have been troubles over the gas supply; but these, so far as we can judge, the Chairman does not definitely allege to have been of Mr. Brown's personal making. They were referred to last week; and any dereliction of duty that produced them must be placed on the right shoulders. A man's responsibility cannot govern the acts of everybody of past or present connection with such a vast undertaking as that at Nottingham. A gas engineer is not superhuman. This we think Mr. Harlow will be quite prepared to admit, because the gravamen of his case against the Engineer is that he has not given his sole and undivided attention to the management of the undertaking. Let us investigate the genuineness of this charge. The agreement between the Gas Committee and their Engineer, it is said, specified that he was not to undertake outside work. We should like to see the complete agreement before accepting this. However, the late Chairman has been raking over the records to find out whether this asserted condition of the agreement has been in any way violated. What has he found as the result? It has not escaped his scrutiny that the Engineer was invited to advise on a certain matter at Holyhead. He reported this to his Committee; and they consented to allow him to advise. Then Mr. Brown did nothing wrong on this occasion; nor can we imagine that Holyhead could produce anything in the way of "exacting or difficult duties" that would divorce his mind from Nottingham, or that could engage his attention excepting for two or three odd days. A similar invitation came from Sutton-in-Ashfield; and in this case permission was not granted. There the matter no doubt ended. Why Mr. Harlow dragged it in at all, unless it was to help to swell out the short list of the terrible enormities of the Engineer, cannot be fathomed. He also takes the paper read at last year's Institution meeting regarding the trials made with blue water gas at Nottingham; and we are almost apprehensive that Mr. Harlow wishes to convey that he, in his wisdom, thinks that the time spent on those experiments was really wasted. There are few of the administrators of great gas undertakings who do not count it an honour when they have in their service an Engineer in the van with those who engage in work of beneficial progressive tendency for not only the gas industry at large, but their own undertaking in particular. The policy of Nottingham in these times is a progressive one. If we are mistaken, then let the Committee immediately estop further investigation work, and stereotype once and for all their management and a policy of inaction. If gas engineers of such large undertakings as that at Nottingham are to be hindered in making investigation, and pilloried when they venture to publish the results (the discussion of which is an advantage), progress will be seriously shackled. The Council of the Institution have shown their appreciation of the value of Mr. Brown's work in this regard by awarding him the Gold Medal; and this alone should suffice to show the City Council what manner of man they have in their Gas Engineer. We cannot believe that, in industrial Nottingham, anyone in the Council—except, perhaps, those who may be taken to have already made tacit admission—would desire to be reckoned among those who are so ponderously conservative as to decry technical investigation. This very piece of research that is supposed to have been the cause of so much trouble in the city, was authorized by the Committee; and the majority of men would cry "shame" on anyone who made it a serious charge against the Engineer. The same with the Holyhead incident. These things do not constitute an irrefragable case of habitual neglect of ordinary duties. If anything, the investigation made into the use of blue water gas at Nottingham asserts the Engineer's originality and thoroughness in work; and these are not invaluable qualities in a professional man.

A Special Committee has been appointed to investigate the condition and working of the gas undertaking; and now the other side of the story will be heard. The report of Sir George Livesey and the statement of Mr. Harlow are public property; and if the latter is composed of the worst that Mr. Harlow can say, then the Special Committee have not a very difficult task before them. But the inquiry must involve a degree of anxiety for the members, as upon them rests the responsibility of doing justice, and not injustice, to one who has evidently been the victim of extraordinary circumstances.

Changes.

THE speeches made at a luncheon subsequent to an official inspection of the new plant at the Leeds Corporation Gas-Works last Tuesday, as reported elsewhere, brought to the front in simple manner the vastness of the changes that have taken place in gas supply during the last quarter of a century. It has indeed been a remarkable period in the history of gas. At the beginning of that period, Mr. Henry Woodall was the Engineer of the Corporation Gas-Works; and then gas was being sold at 1s. 10d. per 1000 cubic feet. Mr. R. H. Townsley is now the General Manager; and gas is being sold at 5d. per 1000 cubic feet more for general purposes. This change has nothing whatever to do with the individual official chiefs. In Mr. Woodall's day, carbonization was being conducted in direct-fired and hand-charged retorts; but at the present day, power retort charging and discharging machinery and inclined retorts are the vogue. Something like 1200 to 1500 cubic feet more gas per ton of coal is now being produced than 25 years since, which is an advantage to the present. There was a much smaller business done in those days; and in some years with the 1s. 10d. price, the Gas Committee had deficiencies in the amount required to meet the capital charges. Now considerable sums—reaching to many thousands of pounds—are annually handed over in aid of the rates. Coal, too, in the eighties, when gas was at the low figure, was, on an average, something like 3s. per ton cheaper than now; and this 3s. per ton is, anyway for the most part, represented by increased expenses of the coal owners in rates and taxes and wages. Residuals, too, in the 1s. 10d. period reached prices never before or since attained, nor likely to ever, taking them together, to be obtained again. These things show how impossible it is to compare on any equality the past and the present. But there is a way of diminishing the difference between the charge of a quarter of a century ago and the 2s. 3d. price of the present; and the Lord Mayor pointed it out. Gas being in Leeds a public service, his advice is—we wonder whether it will be acted upon—that profits over and above requirements of capital, depreciation, reserve, and so forth should be eschewed, and the service rendered to the community at the lowest possible price. Contributions to the rates cannot be defended when an undertaking has not drawn upon the rates for support, or having drawn upon them has refunded the succour, or when an undertaking does not demand exorbitant sums from the ratepayers generally in respect of a municipal service, such as public lighting. It has not escaped notice that at Leeds the price for ordinary purposes is coming down to 2s. 1d. on July 1, when the illuminating power of the gas will be reduced to 15 candles. The prepayment consumers are also to be congratulated on the lowness of the price they will then be asked to pay—2s. 4d., and only 2s. 7d. when a cooker is included. Notwithstanding the difference between the 1s. 10d. and the price now charged and to be charged, there is one thing the present consumers of gas in Leeds can congratulate themselves upon; and it is that from the gas supplied to them they can, by modern and now ordinary means, get several times more illumination from a given quantity of gas than they could a quarter of a century ago. Regarded in this way, the cost of a given amount of illumination is considerably cheaper than it was in the days of 1s. 10d. gas. Therefore the consumers are greatly gainers by the inventions of recent years. Other well-known great happenings call for no mention. There is no doubt that in some years in the eighties the price

in Leeds was a little too low; but the experience in that city shows what changes have been wrought in the meantime. Though the price of coal is now higher, though the price of residuals, taking them all round, is now lower, invention has adjusted matters, and left the industry with a large balance to the good.

Cheaper Gas at Widnes.

On Tuesday last, the Gas, Water, and Electricity Committee of the Widnes Town Council strengthened the reputation they had previously gained for supplying "the cheapest gas in the world" by bringing forward a proposal for a further reduction in price, to the extent of 1d. per 1000 cubic feet, to all consumers inside the borough, and for a grant to the consumers by slot meter of an additional 4 cubic feet for 1d. This will bring the prices down to 1s. 3d. and 1s. 1d. per 1000 cubic feet to ordinary consumers (according to quantity), and to the remarkably low figure of 11d. per 1000 cubic feet for those who use gas for power purposes; while the prepayment consumers will have 44 cubic feet of gas for 1d. The advantage all classes will derive from these concessions was fully brought out by the Chairman of the Committee (Alderman Timmis) when submitting the minutes containing the recommendation. As will be seen from the report which appears elsewhere, he laid stress upon the fact that the prepayment consumers will be placed on as favourable terms as the large ones, and will get for a penny more than twice the average quantity of gas furnished for this sum in other towns. Widnes has beaten the record in this branch of gas supply; and Alderman Timmis was justifiably proud of the achievement, and desirous that the fact should go forth to the world. But the power users come off even better, for they get for the same amount 91 cubic feet of gas, or sufficient to drive a 6-horse power engine for an hour. We should like to see the electrician who could come near this. At even 1d. per unit, according to Alderman Timmis, electricity would cost four times as much as Widnes gas. Cheap as this is, however, some of the consumers are not satisfied. They consider that quality is sacrificed to cheapness, and that if the gas were dearer, but of higher illuminating power, the bills would be lower. This opinion, judging by what transpired at the inauguration of the De Brouwer plant at Darwen the day after the Widnes meeting, is not confined to the latter town. It is not for us to say what quality of gas is best suited for Widnes; that is a matter for Mr. Isaac Carr and his Committee, who are quite capable of defending their position. In these days of incandescent lighting, high illuminating power is less striven for by gas makers, and less required by consumers —taking them as a body—than it was a few years ago; and if Mr. Carr's exceptionally cheap gas answers all requirements, he is to be congratulated on having been able to produce it.

More Corporation Results.

In to-day's number we continue the record of good work done during the past year by those gas undertakings which are in the hands of local authorities. It is impossible here to indicate the special points in all the reports; but it may be remarked generally that they afford very substantial cause for congratulation. What has been accomplished at Widnes, is referred to more fully in another paragraph—and a very pleasant story it makes. Turning to other places, it may be pointed out that at Wigan, an increase of nearly 4 per cent. in the total consumption of gas last year takes the place of a small decrease in the previous twelve months; and it is satisfactory to note that this improvement has extended over all branches of the service—private and public lighting, cooking and heating, and motive power. The revenue has, however, been very substantially affected by a difference, equal to 9d. per ton of coal carbonized, in the receipts from residuals. As the result of the past year's working, the Coventry Gas Committee have a goodly sum at their disposal; and of this £2000 is to be handed over to the district fund, and £5000 to be set aside towards meeting the loss of capital which will be incurred upon the abandonment of plant at the old gas-works when the new ones at Foleshill are in full operation. In addition to this, there is good news for gas users, inasmuch as, in view of the very large augmentation of consumption and the increased profit, the Committee regard the present time as opportune for making a general reduction in price; while they are desirous of meeting the "suction gas invasion" by the offer of special terms to large consumers. Last week we gave some figures showing the results achieved at Lancaster; and here the net cost per 1000 cubic feet of gas sold, including distribution and all other charges, comes out at the highly satisfactory figure of 10·61d. Adding 6·82d. for interest and redemption fund charges, there remains a surplus profit of 6·73d. out of the average price received—2s. 0·16d. per 1000 cubic feet. Bury adds one more to the list of places which are able to report an increased output of gas; and here, again, special consideration has been shown to the large consumers. There was a profit of over £7000 on the past year's working; and, in accordance with the statutory provisions applicable to Bury, one-half of the amount has to go in aid of the rates. This enactment, however, does not prevent the rival claims of consumers and ratepayers from being discussed in the Council; for, as shown by the report in last week's "JOURNAL," several members think "it is the people who produce the profit who ought to get it."

Management Troubles at Middleton.

The announcement made at the close of the article which appears elsewhere dealing with the last annual report and working statement of Mr. E. E. J. Anderson, the Gas Engineer of the Middleton Corporation, will probably not be read with great surprise by those who took note of the remarks of the Chairman of the Gas Committee at a recent meeting of the Town Council, as reported in the "JOURNAL" last week. They expressed dissatisfaction with the results of the working of the gas undertaking, and a desire for a change of management; and a similar feeling was displayed by one of the members, who appeared to hold the opinion that either the Committee should be turned out in a body or that they should have a fresh Chairman. It is always inadvisable to express strong views on subjects upon which one is not at the time fully informed; and therefore it is a pity that the remarks referred to were made before the report of the Engineer was in the hands of the Council. The figures therein presented (some of which are reproduced elsewhere) show that, though the net profit realized was but small—the gross profit of £6508 having to bear annuities and other charges equal to £6324—the balance was on the right side. Unfortunately, owing to domestic affliction and ill-health, Mr. Anderson was compelled to be absent a good deal from his duties last year; and moreover he had to bear the responsibility attending the management of an undertaking which had had three bad years in succession, and was still burdened with a deficit to be cleared off. These troubles have combined to undermine his health; and, acting under medical advice, he has asked to be relieved of his duties, in order that he may have a complete change. Of course, we know nothing of the inner working of the gas undertaking at Middleton; but, judging from what appears in a local paper, Mr. Anderson has not had the free hand which a professional man should be allowed. We sympathize with him in his trouble, and trust that, after a period of rest, he may obtain an appointment in a town where the conditions will be more favourable for the production of satisfactory results than they appear to have been at Middleton.

Dublin Corporation and their Auditor.

Matters do not always go smoothly with the Corporation of Dublin; and just at present they have a nice little question open, which by the time it is brought to a conclusion should have provided the members and officials with quite a large amount of excitement. The other party to the argument is the Local Government Board, to whose Auditor, Mr. J. W. Drury, the Corporation flatly refuse to afford the facilities necessary to enable him to fulfil his duty. Of course, the cause of the dispute has not arisen all at once. The Corporation maintain that they have on various occasions been dissatisfied with Mr. Drury's criticism of their actions. They therefore asked the Local Government Board on the present occasion to appoint another Auditor; and it is their refusal to do so which has brought matters to a head. Apparently the Corporation had committed themselves too far to permit of a dignified retreat from the position taken up; for on the Board's refusal being received, they decided to adhere to their former decision not to let Mr. Drury inspect the books. The possibility of the Clerk being haled off to prison as a consequence of this resolution, was regarded with a considerable

amount of equanimity by the councillors; but, fortunately for this official, later events seem to point to the unlikelihood of his having to suffer for carrying out instructions which he rightly looked on as binding upon him. From the Council Chamber, the dispute was removed to the King's Bench Division of the Irish High Court, where a *mandamus* was applied for on behalf of Mr. Drury, requiring the Town Clerk to produce the books and accounts of the Corporation. Here the matter remained at the end of last week; for the Lord Chief Baron showed a strong disposition to have before him the real parties—the Local Government Board and the Corporation. He asked, on the one hand, whether the Court were to put the Clerk in the position that if he obeyed his masters he would be sent to gaol; while, on the other, he remarked that it was a monstrous thing for the Local Government Board to throw all the burden of the affair on their own officer. The matter was therefore adjourned. It will be interesting to see how far the Corporation will in the end be successful in their endeavour to get rid of an Auditor who has so greatly hurt their feelings by his criticism.

Legal Proceedings by Subscribers for Shares in the "Kent County" Gas Company.

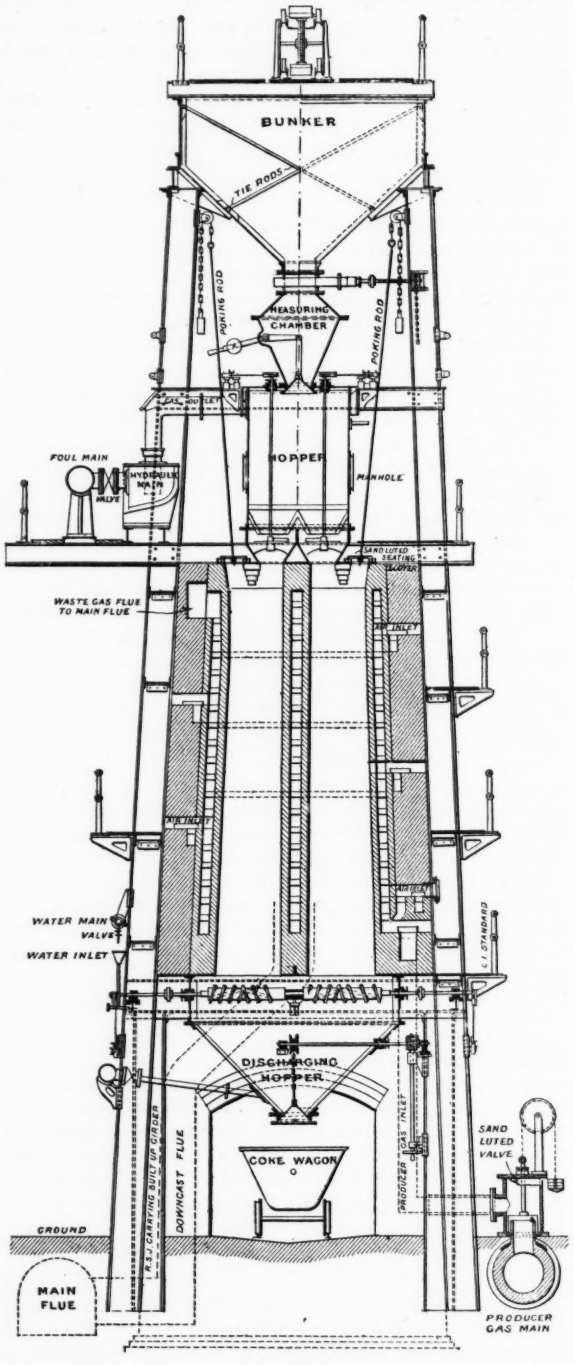
The last word has not been said about the promotion of the Kent County Gaslight and Coke Company, Limited; the promoters themselves having the prospect of facing some little litigation before they will confidently know how much capital and how many shareholders they will have at the commencement of their operations in the pastoral district of Goudhurst. We are informed that Messrs. Corbould-Ellis and Mitchell, Solicitors, of No. 14, Clements Lane, E.C., are acting on behalf of a number of subscribers for shares in the above Company, and are taking proceedings on their behalf for the rescission of their contracts and the rectification of the register of the Company. It would have been surprising if steps of the kind had not been taken when the character of the prospectus is compared with the actual facts, and when the Chairman of the Company (Mr. S. B. Darwin) finds that the retention of that undignified position would blemish his name and reputation as a gas engineer.

Corporations as Coal Buyers.

The question of municipal coal supplies was once more touched upon at Bradford last week, though the debate in the City Council really arose over a far less drastic proposal. It seems that the numerous Committees of the Corporation who have to purchase coal do so at widely different prices—no doubt mainly owing to the varying qualities, though, of course, the quantity contracted for in each individual case may have something to do with the matter. However this may be, the proposal was brought forward "that it should be an instruction to the Gas Committee to purchase all ordinary house or domestic coal required by the departments of the Corporation;" and this was carried by a substantial majority. Perhaps there would have been even less opposition than was the case, had not the fear arisen in the minds of various members that it was merely "the thin end of the wedge," and that a municipal coal supply was in reality the final goal. In favour of the idea it was urged that consolidation had been already applied with satisfactory results to several branches of Corporation work, and so it was only a common-sense proceeding to extend it to the purchase of coal; in addition to which, of course, the Gas Committee had all the necessary apparatus for making scientific tests. Certainly, it appears that, if such a scheme is to be carried out, the Gas Committee are at least as well qualified as any other to undertake the work; and the idea of consolidation has, it must be admitted, something to recommend it. The Chairman, however, pointed out that the Gas Committee had no more experience than the others in the purchase of house and steam coal; and thus it seems the chief advantage to be looked for will be so much as may be gained by the making of larger contracts and distributing the coal themselves. One member suggested that a committee of experts should be appointed for the purpose; but this idea met with no support. Thereafter the discussion developed into a consideration of the merits of municipal trading; and the tone of the remarks clearly indicated that any proposal to introduce a municipal coal supply would meet with the strongest opposition at the hands of many members of the Council.

YOUNG AND GLOVER'S VERTICAL RETORTS.

It will be remembered that, earlier in the present year, Mr. William Young, of Peebles, contributed a series of articles to the "Journal," on the subject of "Vertical Retorts for the Production of Illuminating Gas." In the course of the fifth article, which appeared in the number for April 17 (p. 163), Mr. Young enumerated various principles which he stated might be applied



to the carbonization of coal for the production of gas; and he promised to send for early publication a sketch of the type of setting which he considered would best meet the requirements of the case. We are now able to supplement these remarks by giving an illustration of the vertical retort-setting which he and Mr. Samuel Glover have designed for this purpose.

The death occurred recently of Mr. E. Bryan Donkin, eldest son of Mr. T. Donkin, and grandson of Mr. Bryan Donkin, who founded the business of Messrs. Bryan Donkin and Clench, lately converted into a limited liability concern under the style of the Bryan Donkin Company, Limited. Deceased, who was 53 years of age, managed the business from 1886 until about two years ago, when he relinquished his duties owing to ill-health.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING, JUNE 19, 20, and 21.

INAUGURAL ADDRESS OF THE PRESIDENT,

Mr. CHARLES WOOD, F.C.S., of Bradford.

In addressing you to-day, I have first to express my appreciation of the honour you have conferred upon me in placing me in the position of President, the responsibility of which I was most reluctant to undertake. But I recognized that acceptance of the office, while being an honour to the recipient, provided him at the same time with an exceptional opportunity of rendering his best services to the Institution. And it is perhaps appropriate that my term of office should fall this year, as it marks the completion of my twenty-five years' active work in the gas industry and of twenty-one years' membership of the Gas Institute and the present Institution.

The preparation of an address to such an Institution as ours must always, I think, be a matter of some anxiety, when the President is not necessarily elected on account of any exceptional ability or knowledge, and where every member is more or less an expert in some branch of the profession. In recent years we have had able addresses upon various problems of gas engineering, and others dealing largely with specific subjects upon which the authors have been acknowledged masters. It is justly said that the older we grow, and the more knowledge we acquire, the more conscious we are of our own limitations. As it is only the lessons one learns in his own actual work that are really valuable, I think I cannot do better than give you, as far as is practicable, a few of the conclusions I have come to as the result of my personal experience, in the hope that some at least of my observations may be useful.

A brief reference must, however, first be made to some of the more important events of the past year. My term of office has not been marked by any startling developments in the gas industry, although we have a year of steady progress to record.

The report of the Council, which has already been presented to you, indicates the healthy condition of the Institution; and the large accession of new members is a satisfactory feature.

Substantial progress has been made towards the development of the Institution's work along the lines indicated by our esteemed Past-President, Mr. Dougall, at our first meeting three years ago. The rate of progress perhaps appears slow; and much of the detail work has been accomplished outside the Institution itself. The appeal on behalf of our Special Research Fund, which we have made to every gas undertaking in the kingdom, will we trust meet with general support. There should be no need for me to urge the importance of the scheme; but I hope that each member will feel it his duty to see that the matter is carefully considered by his Board.

The benefits arising from the affiliation of the District Associations are now evident to all; and the representative members on the Council have been of the greatest assistance in our work. Their presence will, I am sure, continue to be one of the best safeguards against any recurrence of the sectional jealousies that, to some extent, prevailed a few years ago. Members in different parts of the country may not always agree as to the relative importance of particular subjects. Consequently, there may occasionally be a feeling in one district that too little attention is being given by the Council to special matters which the members in that district consider urgent. Ideas of this kind have sometimes led certain District Associations to combine, in order to secure the election of their particular nominees upon the Council. Direct representation, however, has happily removed any excuse for this unfortunate method of procedure, which I am convinced did not serve our best interests. An examination of the list of the present Council will show that the members are very well distributed over the whole country. I am sorry that the two Scotch Associations do not yet see their way to join us; but I trust that it will not be long before we shall be able to welcome them and to make the roll complete.

The various Junior Associations have done much useful work during the year; and the members generally have been eager to avail themselves of the advantages of frequent meetings and discussions. The London Junior Association—where the members reside nearer together, and where one would expect they could attend the meetings with the least expenditure of time and trouble—appears to be the only one showing signs of apathy. Surely, it cannot be that the London Juniors consider that they already know all there is to be learnt in their profession? The members of the Junior Associations are those upon whom will fall the responsibility for the future of the gas industry, and I should very much like to see more done to bring these younger men into closer association with our Institution.

I must say a few words about the Commercial Sections which have been established by several District Associations. The formation of these is due, as most of you probably know, to the initiative and energy of Mr. Meunier, of Stockport. In Lancashire and Yorkshire, where the Sections have been in active work for several years, they have proved very successful. Many matters more or less of a commercial nature are discussed at our monthly meetings; and the practical advantages of this exchange of information to the various gas undertakings for which we are responsible, cannot be disputed.

The report upon the education of engineers, which has recently been issued by the Institution of Civil Engineers, should have the careful attention of all those who can influence the training of any young men intended for our profession. The report is the result of very comprehensive inquiries; and since it expresses the opinions of the majority of a number of eminent engineers—supported by the authority of the Institution of Civil Engineers—it will, no doubt, be largely acted upon. I wish, however, to suggest that the best course of training for young mechanical or civil engineers is not necessarily the best for young men who intend to become practical gas engineers and managers.

Mr. F. W. Stevenson, in his admirable address to the Midland Association in February last, emphasized the necessity for young men gaining a practical knowledge of the management and control of workmen. No Technical School or University can give this experience; and in my opinion it can only be satisfactorily gained early in a man's career. A young man who only begins his practical training in a gas-works at the age of 21 or thereabouts, has, I think, small chance of becoming a successful manager, however complete his theoretical training may be. Mr. Stevenson's advice on this important matter is exceedingly valuable.

While speaking on education, I am glad to have the opportunity of acknowledging the work that has been initiated at the University of Leeds by Professor Smithells. The establishment of a Department of Applied Chemistry, with Dr. Bone, F.R.S., at its head—to specially include the manufacture and use of coal gas—is an advance on the part of the authorities which should command our hearty support.

I have often felt that at the annual meetings of the Institution during recent years we have not sufficiently recognized the necessity of doing more for those members who have charge of comparatively small works; and on glancing over the reports of proceedings of the last few years this has again struck me very forcibly. We have had many able papers—most of them of a highly technical character, and showing careful and painstaking preparation. Many of them, however, have their chief application to the larger gas-works. Out of our 679 ordinary members, nearly 250 represent undertakings whose annual make of gas is less than 100 millions. While the District Associations do, and will no doubt continue to do, a good deal in this way, I should like to see a larger proportion of papers at our annual meetings more helpful to the smaller undertakings.

Few gas engineers have had serious cause for complaint during the past year with respect to troubles with their

workmen. It is a matter for congratulation that in gas-works generally a far better understanding prevails between the managers and the men than was the case a few years ago. I cannot understand the position of those who still maintain that workmen have no right to combine and employ paid officials to defend their interests. The old feelings of resentment against Trades Unions, legitimately conducted, are just as useless on the one hand as, on the other, was the old antipathy of the men to the introduction of machinery. The time has gone by for attempting to ignore the power of the Workmen's Associations, although there are still a few gas managers who persuade themselves that they at least are independent of the interference of the Unions.

In the Bradford Gas-Works, we have always recognized the right of our men to belong to any Union they like. We are willing to freely discuss any matters affecting the men's welfare with the Union officials. By doing this, I am certain that we avoid misunderstandings; many difficulties are removed; and much worry is saved. Of course, a great deal depends in each case upon the individual tact and ability of both the manager and the Union representative. I am, however, more than ever convinced that a frank recognition of the men's organization is, in the long run, the best course for any manager to adopt. Let me commend this plan to those who have not given it a fair trial.

The success of the Metropolitan and other Gas Companies in obtaining the abolition of the onerous restrictions imposed upon them as to sulphur compounds, and the adoption of the scientific burner invented by Mr. Carpenter as the standard for gas testing, are the most significant advances in gas legislation during the year.

Most works throughout the country have regularly supplied gas containing from 30 to 60 grains of sulphur, without the slightest injury to anyone. In Bradford, we have employed very little lime for purification during the past thirty years; and we use a large proportion of local coal, which yields a considerable amount of carbon bisulphide. But I do not remember that we have had a serious complaint of the gas on that account. In this connection, our experience with cyanogen extraction should be interesting. At one of our stations, where we have had the process in continuous operation during the past twelve months, we have treated the gas from 56,386 tons of coal, and have recovered 91,619 lbs. of cyanogen in the form of ammonium sulphocyanide. This is equivalent to 1·625 lbs. of cyanogen or 4·75 lbs. of ammonium sulphocyanide per ton of coal carbonized. The working of this process has been decidedly profitable and has certainly reduced the quantity of carbon bisulphide remaining in the gas; but as we have not made a practice of regularly testing our gas for sulphur compounds, I am unable to give you actual figures on this point.

Suction gas is perhaps one of the most frequent topics of discussion among gas engineers at the present time, and in many towns the price of gas for power has been substantially reduced to meet its competition. The advisability of having differential rates for lighting and trade purposes must depend largely upon local conditions. Two scales of charges may be necessary in towns where the ordinary selling prices are high; but it is open to question whether they are to be recommended in places where cheap gas can be supplied to all classes of users. Differential prices, whether for lighting and power or for prepayment and ordinary meters, often cause much grumbling; and we should not forget this fact when dealing with the question, especially in towns (as in Bradford) where less gas is used for engines than for other trade purposes. Apart from the consideration of prices charged, it is obviously unfair that gas undertakings should be expected to provide a supply of gas for any suction plant simply as a standby; and this is a matter upon which combined action may well be taken.

The year has been prolific in the introduction of several new and improved types of stoking machinery, and considerable attention has been given to the vertical retort. I do not wish, however, to anticipate the papers and discussions upon both these subjects which we are to have during the meeting.

Having been associated with municipal gas-works all my working life, I am induced to give you some of my reflections upon municipal control as far as, in my opinion, such control influences our industry. The subject is one that is well worth the careful and impartial consideration of gas engineers, as well as of those who are entrusted with the administration of local government.

In the following observations, I do not, of course, intend my criticisms to apply to any town in particular; nor do I wish to condemn the principle of municipal ownership of gas-works. On the contrary, it is my firm conviction that it is better for the supply of such monopolies as gas, water, and electricity to be under the control of the community. When, however, these undertakings are administered with the main object of extracting as much profit from the consumers as possible, then the advantage of such ownership ceases, and the very faults of private monopolies are retained against which the public ought to be protected. The time has come when gas engineers as a body need to utter a strong protest against the methods of administration that many corporations find it expedient to adopt with regard to their gas undertakings. It is commonly stated that a gas manager ought to have no concern with matters of municipal finance; but surely it is part of our duty to secure, as far as we can, fair play for the undertakings entrusted to our charge, and to endeavour to show the municipal authorities what the inevitable results of certain lines of policy will be. As nearly all the larger gas undertakings in my immediate neighbourhood are owned by the local authorities, I have many opportunities of closely observing their methods of administration.

The rapid increase in rates is a general cause of complaint in many towns. Expensive schemes are lightly entered upon—often solely in order to gain the support of a particular section of the community. After a few years—when interest and sinking fund charges have to be met—the real cost of the work in question begins to be realized; but by this time probably nearly the whole *personnel* of the council is changed, and no one, of course, considers himself or his party responsible. We find that the average municipal life of a member of a town council is less than four years; while in many towns where party feeling runs high it appears to be the practice to change the chairmen of important committees as often as possible. Is it surprising, therefore, that so little real interest is taken in the progress or welfare of gas undertakings by so many members of councils? I fear it is too much to expect that they could take the same pride in the progress of their works that gas directors, having large personal financial stakes in their undertakings, must necessarily do. But I am confident that, if only party politics could be eliminated from municipal administration, the members would deal with important matters in a manner very different from that at present adopted.

The outcry about high rates leads many councillors and their financial advisers to shirk the responsibility for as much of the previous extravagance as they can. They easily succumb to the temptation of appropriating large sums of money from any of the so-called trading departments they happen to possess. The gas undertaking is often the only department having any surplus funds; and it suffers accordingly. I believe most chairmen of gas committees realize the permanent injury that such a policy inflicts upon the gas-works. They do their best to reduce these appropriations as much as possible; but they are generally outvoted when the matter comes before the council, who remorselessly allocate to other purposes funds which should be strictly used for the benefit of the gas-works, and in some cases urgently needed for reconstructions or renewals.

The attempts to justify these appropriations, on the ground that ratepayers owning gas undertakings are entitled to a substantial share of the profits on account of the supposed risk they incur, is so transparently absurd that it really deceives no one. Advocates of this class conveniently ignore the facts that the ratepayers are never called upon to make up any deficiency; that they have never, as ratepayers, invested a penny in the gas undertaking (which has, of course, been paid for with borrowed money); and that by the operation of the sinking fund the gas consumers are gradually making the town an actual present of the undertaking.

Since the transfer of the Bradford Gas-Works, in 1871, the Council have taken from the Gas Department for the relief of rates no less than £923,495. Our present debt is £856,231, of which £390,000 represents the actual debt on the old portion of the gas undertaking. The Bradford consumers have thus been made to contribute an amount more than sufficient to have discharged this debt twice over. While such a policy of appropriation may not have done much harm twenty years ago, the case is now quite different, when we have so many competitors.

In spite of the fact that all our profits are still taken for the

relief of rates, a serious attempt has just been made to advance the price of gas in order to still further augment our contributions. An advance in price for such a purpose, when the undertaking is already making a substantial profit, would surely have been a record in municipal maladministration, and at the present time would certainly have most disastrous results.

Gas undertakings belonging to local authorities not only suffer by having their funds depleted, and by gas being sold at too high prices, but in many towns the managers are obliged to waste a good deal of their time and energy in trying to satisfy the different members of their councils on many points of detail. What ordinary politics can have to do with the manufacture of gas I have never been able to discover; but in some towns it seems to be the practice to award praise or blame to the management according to the political bias of the committee concerned. Such proposals as the adoption of labour-saving machinery, extensions of plant, improved apparatus, or methods of working, are made entirely party matters in many towns, adding enormously to the worries of the unfortunate engineer. I have known an absolutely straight party vote given by a council upon the merits of a chemical process which probably not a single member had sufficient technical knowledge to understand. It was quite enough for most of them to know the politics of the predominant party in the committee recommending the scheme. Again, a great deal of time is wasted upon trivial matters, perhaps the erection of an extra street-lamp, the saving of a shilling or two on stationery, or the purchase of a few pounds' worth of apparatus. Schemes involving the outlay of many thousands of pounds are often passed with little or no comment; while any proposal to grant a small increase of salary to an official provides a topic for several hours' discussion, and is one upon which nearly every councillor can wax eloquent.

The increasing tendency shown by many corporations to limit the already miserably inadequate salaries paid to their staffs, is little short of scandalous. But I am afraid there is not much hope of improvement in this respect until the public are brought to realize how much their interests suffer by such a short-sighted policy. The salaries of officials in most towns form a favourite point of attack by indignant ratepayers; and the subject is a godsend to the anonymous contributor to the local Press. Many town councillors seem incapable of realizing that a competent engineer, who saves his employers many thousands of pounds in a year, is worth considerably more to the ratepayers than he is usually paid. Smaller salaries than ever are now offered, both by corporations as well as by some gas companies, to their officials, with the inevitable result that the most promising young men who might be attracted to the profession are selecting other branches of engineering. The ultimate effect of this policy, if continued much longer, cannot fail to be disastrous to the industry. There are signs, however, that in many towns the intelligent public are beginning to realize that their interests and pockets are suffering from the "penny wise and pound foolish" methods of the narrow-minded class of politicians who now dominate some councils.

There is no doubt that the majority of gas engineers serving local authorities—especially in small and medium-sized towns—are not as fairly treated as they would be by gas companies, or as they have a right to expect. In those towns, however, where local affairs are directed by capable, practical men, and the gas and other municipal undertakings are managed upon sound business lines, there is no doubt, I think, that municipal ownership is a decided advantage to the community.

I have dealt at some length with the subject of municipal ownership because I feel strongly that at the present time the policy applied by some local authorities to the administration of their gas-works will, if continued, have a serious and permanent effect, not only upon their own concerns, but upon the whole industry. A drastic alteration in the methods of many corporations in this respect is, I believe, of more pressing importance than many matters of engineering. I have not the slightest wish to depreciate the importance of sound engineering; but I am convinced that managers who can influence their committees in the direction I have indicated, are doing as much for the benefit of the industry as those who are concentrating their attention upon purely technical matters.

Comparisons are occasionally made between municipal and company management of gas undertakings, and general conclusions are drawn—based upon published working results—as to the merits or demerits of each. It appears to me, however, that the problem is by no means such a simple one. So much depends upon circumstances other than those shown in, say, the Board of Trade returns. As Mr. Irving, in his most able address, pointed out last year, the geographical position of the different works is an important factor in the case. Allowance is usually made for this when considering individual results; but it is not sufficiently realized when contrasting average figures from groups of undertakings. The large majority of gas-works owned by local authorities are in the North and Midlands, and principally in the manufacturing districts, where they have many advantages. On the other hand, the companies predominate in the South. It is interesting to note that there are eleven counties in the South of England in which 105 gas companies are established, but where there is not a single gas undertaking owned by a local authority. It would therefore appear that the geographical advantages of the majority of gas undertakings belonging to local authorities may account very largely for the comparatively successful results which they are able to show, in spite of the obstacles to their progress due to mistaken methods of administration.

Now that Parliament appears to more favourably regard the aspirations of the various municipalities who wish to own the local gas undertakings, it is probable that we shall shortly see greater activity in this direction. During recent years the high prices which several corporations have had to pay in order to buy out the gas companies have doubtless deterred many others from following their example; and it is not likely that any gas undertakings in the future will be transferred at less than their fair value.

The experience of Bradford, where our capital account has been doubled by the purchase of four additional gas companies' undertakings and a portion of a fifth, is, I believe, quite exceptional, and is not without its lessons. In 1898, the Bradford Corporation—finding that with improved tramway facilities a good many people were removing to the suburbs—decided upon a comprehensive scheme for extending the city boundaries. This scheme was to absorb no less than nine adjoining townships, and would, if carried out in its entirety, have increased the area of the city from 10,776 to 29,026 acres. All sorts of inducements were held out to the various districts to gain their consent to inclusion within the city. Amongst others, gas at Bradford rates was promised. To do this, of course, meant buying out a number of gas companies; and this promise was actually given before any estimate of the probable cost was obtained. Some of the townships agreed to the scheme; but the most important district declined. When the matter was contested, only the willing townships were included—much to Bradford's disappointment.

In the year 1899-1900, before the extension of our area of supply took place, the quantity of gas sold by the Corporation amounted to 1719 million cubic feet. The debt on the gas undertaking was £445,861; and interest and sinking fund charges for the year were £26,821. The capital account was £259 per million cubic feet of gas sold, and interest and sinking fund cost £15·6 per million feet sold. In the year 1900 the price of gas was increased, and our sales fell off very seriously. The gas companies were bought out, as far as possible, by agreement, and at good prices; and the charges for gas in the added districts within the city were reduced according to promise. In the year 1903-4, our sales were only 1880 millions, and our capital debt had been increased to £892,632, or £474 per million feet sold. The annual charge for interest and sinking fund had risen to £59,229, or £31·5 per million feet sold. The Bradford Corporation have altogether spent nearly £500,000 upon the purchase of the additional gas undertakings, of which £330,000 represents the amount paid for goodwill. Of the amount of 1s. 11¼d. per 1000 feet now paid by the gas consumers in Bradford, 4½d. goes to meet our standing charges on the cost of purchase.

Capital Charges before and after Extension.

	Years ended March 31.		
	1900.	1904.	1906.
Gas sold, million cubic feet .	1,719 ..	1,880 ..	1,946
Debt on undertaking . . .	£445,861 ..	£892,632 ..	£856,231
Do. per million feet sold . .	£259·37 ..	£474·80 ..	£439·99
Interest and sinking fund . .	£26,821 ..	£59,229 ..	£59,037
Do per million feet sold . .	£15·60 ..	£31·50 ..	£30·33

During the last five years, the consumption of gas in the old portion of the city has remained practically stationary; while in the added districts, where the price has been reduced 1s., the sales have increased 45·2 per cent.

In Bradford the owners of cottage property are responsible for payment for the gas used by their tenants; and as in the year 1900 gas was being used in nearly every house in the city, there was no scope whatever for the development of the prepayment meter. We have, therefore, not been able to counterbalance the reduced sales caused by the extended use of incandescent burners during the past few years by obtaining more cottage consumers, as so many other gas undertakings have succeeded in doing.

In 1900, when our price of gas was raised 3d. per 1000 cubic feet on account of the increased cost of coal, this advance proved to be a serious check to our progress. Whereas in the six months preceding the alteration, our sales showed an increase of 6·37 per cent., they fell off during the succeeding six months, so that we had a decrease of 7·68 per cent. In each case the comparison is with the corresponding six months in the previous year.

In the light of subsequent experience, I have not the least doubt that we should have done much better, and have even obtained a larger total net profit during the past five years, if we had retained the low price.

The fear of electrical competition no longer seriously disturbs us. Under the existing relative conditions of gas and electricity supply, we have no cause for anxiety. We must, however, not rest content with our present position in this respect. Although the actual cost of lighting by electricity during the past year or two shows very little diminution, we cannot tell when some new and important development—either in the cost of generating electricity or in its application for lighting—may occur. It may be that some epoch-making discovery—as important to the electric lighting industry as the invention of the Welsbach mantle was to our own—may entirely revolutionize the present methods of electricity supply. If such a thing happens, those gas undertakings which, either from heavy capital charges or other causes, cannot supply cheap gas, will be heavily handicapped.

Cheaper gas must be our aim. Immense possibilities for developing the use of gas for various purposes await us if only we are not too much hampered in our efforts to provide a cheaper supply. The great progress made in Widnes, Sheffield, Plymouth, and other towns where gas is cheap, affords ample evidence of the success of such a policy. With gas at 1s. to 1s. 3d. per 1000 cubic feet, we can smile at the manufacturers of suction-gas plants and their alluring advertisements of 10 brake-horse-power for 1d. per hour, &c. In these misleading statements of cost—which, of course, omit such important details as wear and tear, interest, attendance, and risk—one is reminded of the similar methods of the electricity companies only a few years ago, whose canvassers usually asserted that electricity was cheaper than gas for lighting. This very questionable policy undoubtedly brings its own punishment, as electricians are now finding out to their cost.

The unfairness of subsidizing municipal electricity departments is fortunately becoming somewhat more clearly recognized, especially in those towns where the local authority also own the gas-works. In Bradford, we have had a longer experience of municipal ownership of electricity supply than any other town in the kingdom. It will therefore, I think, be instructive to compare the progress of the two undertakings since the electricity works were first started, and for this purpose to extend the tables I gave at the annual meeting of the Manchester District Institution in 1901.

It will be observed that the quantity of electricity sold to the Tramways Department last year amounted to 61 per cent. of the total; also that, for the first time in the history of the electricity undertaking, the total sales for the year show a decrease.

Apart from the influence that the development of electricity has had upon the use of gas in Bradford, the cost of laying mains and services and the difficulties of distribution have been seriously increased by the multiplicity of electric cables. Until recently, the cables were laid in a most reckless manner—quite regardless of any consideration for gas or water pipes, and in spite of our repeated remonstrances. No correct plans were kept of the actual positions of the cables; and consequently when they began

	Electricity Sold. [Thousands of Units.]					Gas Sold. [Millions of Cubic Feet]			
Years Ended Dec.	Private Lighting.	Motive Power.	Tramways.	Street Lighting.	Total.	Private Consumers.	Gas-Engines.	Public Lighting.	Total.
1889	22	..	..	..	22	1245	..	118	1363
1890	108	..	..	..	108	1266	..	131	1397
1891	239	..	..	..	239	1268	..	139	1407
1892	362	3	..	..	365	1366	..	141	1507
1893	461	19	..	..	480	1308	..	144	1452
1894	525	29	..	..	554	1328	..	147	1475
1895	637	36	..	..	673	1460	..	149	1609
1896	754	55	..	4	813	1445	..	149	1594
1897	860	117	..	16	993	1465	..	137	1602
1898	980	205	202	32	1,419	1460	..	138	1598
1899	1275	464	618	59	2,416	1533	..	142	1675
1900	1466	932	954	76	3,428	1444	71	123	1638
1901	1656	1297	1889	59	4,901	1394	68	99	1561
1902	1911	1900	5259	54	9,124	1506	75	113	1694
1903	2133	2541	7075	57	11,806	1650	81	130	1861
1904	2571	2654	8674	59	13,958	1690	87	140	1917
1905	2539	2660	8503	65	13,767	1695	88	146	1929

Remarks.—During the years 1895 to 1900, the whole of the public gas-lamps were converted to the incandescent system. In 1902-3, the area of the Corporation gas supply was extended.

to fail, the troubles of the department became very serious. Fortunately for us, in nearly all the principal streets gas-mains had been laid under the footpaths on each side. Otherwise, in many places it would have been impossible either to reach our existing service-pipes or to lay new ones.

We have not yet been able to prove any specific case of actual damage by electrolysis, although I am convinced that we are losing an increasing quantity of gas from this cause every year, especially along tramway routes several miles away from the electricity generating station. At distances such as these, there is a considerable difference of potential between the tramway rails and the gas and water mains. Consequently, where the intervening ground is a fair conductor, owing to the presence of moisture, we find electricity flowing into our pipes. At the places where these stray currents leave the mains, as well as at those joints where there is not good electrical contact, we shall have electrolysis, with its consequent corrosion of the metal. Unfortunately, although it is usually comparatively easy to detect the points where the current enters the mains, it is exceedingly difficult to locate the more numerous places where it leaves them, and where most of the actual mischief is done. But in the matter of damage to mains, caused by the fusion of electricity cables, we have been particularly unfortunate and have had several serious accidents. We have had large holes melted in 5-inch and 12-inch mains, and on two occasions in 18-inch mains, besides having many lengths of service-pipes and small mains destroyed. Several fires and explosions have occurred as the result of electricity flowing along the gas-service into buildings and then burning the pipes inside at places where they were in proximity to water-pipes.

The increasing frequency and danger of these accidents during the last three years have roused the Corporation to the necessity of doing something to minimize the risk of their recurrence. Our Electricity Department is now doing everything possible to prevent any further serious damage to gas-mains. Many of the old cables are being replaced by new ones which are much more substantially protected; and these are kept as far away as is practicable from gas and water pipes. Feeding cables, wherever possible, are being laid 4 to 5 feet deep, and distributing boxes are being fixed above ground throughout the city at all places where the feeders are coupled to the service cables. These boxes are fitted with automatic fuses and cut-outs, so arranged that any faulty cable may be put out of action before it has time to do our pipes much harm. We have also fortnightly conferences of the chief officials of the various departments responsible for street-work. All proposed schemes are discussed, and we can thus arrange for new work or alterations to pipes and cables being carried out with due regard for all interests. Our electrical experience in Bradford has been expensively learnt; but it should be taken to heart in other towns where similar troubles may be expected in the future as the insulation of the cables gradually wears out.

A secondary effect of the most recent instance of cable fusion in Bradford will, I think, be interesting to you, especially as it was the occasion of one of my rare acquaintances with naphthalene. This case occurred on Feb. 22 of this year, in Market Street—our principal thoroughfare in

the centre of the city. The staff at the generating station observed a serious leakage about 9.30 P.M., and the cable was burnt out at 9.55 P.M. A large hole, 10 in. by 4 in., was melted in an 18-inch gas-main, against which the cable had been laid; but the hole was partially plugged by the fused *débris*. I must explain that the central portion of Bradford is supplied with gas by an extensive network of mains from three of our gas-works situated on different sides of the city. As our pipes are connected as far as possible at every street junction, the streams of gas travelling along the various trunk mains intermingle at many points, so that it is often difficult to say from which works any particular main is being supplied. At the time of the accident, the gas would be passing along this 18-inch main at the rate of about 35,000 cubic feet per hour, or with a velocity of about 100 yards per minute. It was, of course, impossible afterwards to determine the exact time when the pipe became really hot; but between 9.45 and 10.10 P.M., on the night of the accident we had some curious results. The supply to every consumer who was using gas from this main, within a distance of about 600 yards from the point of fusion, was more or less seriously affected by deposits of naphthalene.

I should say that, generally, we know very little of naphthalene troubles in Bradford. We may have a service-pipe stopped every year or two; but with 78,000 consumers this is not a bad average. On this occasion, however, 57 street-lamps were extinguished within a few minutes, and almost every burner in premises where gas was being used at the time was choked with naphthalene. Several hundred burners were stopped up altogether, but only one service-pipe was almost blocked. This was a 2-inch pipe supplying a large restaurant and billiard-rooms, which at the time were very busy. We never find naphthalene in our street-mains, and there was no trace of it in the 18-inch pipe when we took out several lengths the following day and made a thorough examination. The naphthalene that caused the trouble must have been produced in the gas by the extreme heat, and evidently it did not come from any previous deposit in the main. The main and the earth for a distance of 30 yards were still very hot twelve hours after the current had been shut off. The lamp-fittings and the burners were cleared out the next day, and we have had no evidence of naphthalene since that time.

The importance of economy in capital expenditure is now more generally realized than it used to be. I have no intention of repeating what I said on this subject in 1901; but my subsequent experience has abundantly justified my remarks at that time. Every hundred pounds spent on capital account will entail an annual charge upon the undertaking of from £4 to £7 for many years. Before any serious outlay on new plant is incurred, we must be absolutely certain that the economy to be effected by its introduction will be amply sufficient to cover these charges. When the money unprofitably spent is measured by tens of thousands of pounds, the burden is a very serious one, as many gas engineers have reason to know. How the engineer of a works whose capital charges, through no fault of his own, are 10d., 1s., or even 1s. 6d. per 1000 cubic feet of gas sold, must envy the manager of an undertaking where these charges only amount to some 3d. or 4d.!

When deciding upon the introduction of improved apparatus, it is astonishing how often the mistake is made of assuming that the plant can be profitably worked nearly all the year round. It is, however, frequently the case that, on account of the small summer demand for gas, it may not be worth while to work it for more than 150 or 200 days; and this fact, in practice, may convert the estimated profit into an actual loss. There are many gas-works where, in order to have everything up-to-date, expensive reconstructions and improvements have been carried out, with the result that now gas cannot be supplied as cheaply as it could have been with their old plant. To the younger gas managers, and especially those serving corporations, who are ambitious to be able to show up-to-date works, I would advise caution. Before spending money either on improvements or extensions, be sure that your scheme will result in the supply of cheaper gas.

The supply of even 16-candle power gas is rapidly becoming a thing of the past. We are nearly all agreed that low-grade gas is the most economical; but in this matter I think that some engineers and their boards are in too great a hurry. It is a mistake to reduce the illuminating power to any considerable extent before the consumers have been educated up to the use of incandescent burners and have been persuaded to discard their flat-flame burners. The proportion of flat-flame gas-burners in regular use in this country is still very large; and any sudden reduction in illuminating power will inevitably give rise to many complaints. Every encouragement should be given to consumers to adopt incandescent lighting. The system of maintenance of burners should be undertaken by every gas authority, and at the lowest possible rates. It will be found that although in a few instances smaller quantities of gas may be used, this will only be for a short time, as the habitual use of a better light soon creates a demand for more.

While the importance of educating our customers to the universal use of the incandescent burner is now generally recognized, it is surprising that so many towns still retain numbers of flat-flame burners for street lighting. According to the latest published returns, there were in England and Wales only 325,000 incandescent public lamps out of a total of 589,000; and in Scotland and Ireland, 43,000 out of 110,000. No doubt more lamps have since been converted; but surely it would pay the gas authorities to have this state of things altered, and even, if necessary, to meet the cost of the alterations at a temporary sacrifice.

The attitude recently taken up by the Local Government Board with reference to the proposed extensions of electric street lighting at Bridlington and Newcastle-on-Tyne, is a valuable, if somewhat tardy, recognition of the superiority of incandescent gas lighting over its competitor. The public also are beginning to realize that, apart from the economical side of the question, the claim made on behalf of electricity —that its use is better for health—is quite untenable. With the extended use of incandescent gas lighting, considerably greater pressures are now generally employed in distribution than was the practice formerly. Our area of supply in Bradford ranges from 170 to 1090 feet above sea level; and as the gas has to be forced down several hundred feet to reach some of the districts, we necessarily have in many places pressures of 6 inches and more. By carefully adjusting the burners for these pressures, we easily obtain a high efficiency for them, especially in the street-lamps.

As to the future, we have every cause for encouragement. The prospects of the gas industry were never so promising as they are at the present time. With the urgent necessity for less smoke and dirt in our towns, the uses of gas for trade and household purposes are almost unlimited. Some of the possible applications of gas have as yet scarcely been even touched upon. The principles governing its satisfactory employment for the heating of rooms are still imperfectly understood; and I believe that in this direction alone lies a most profitable field for investigation. But our measure of success along these lines will be limited by our ability to provide a cheap supply of gas; and I must repeat that, in my opinion, this is the ultimate object for which we must all strive.

The members of the Institution of Gas Engineers visiting Boulogne on Friday are, Mr. Dunn reports, to be received on arrival by the Mayor and Mayoress, M. and Madame Péron.

The Staveley Company, of Chesterfield—of which Mr. C. E. Jones, formerly the Engineer and Manager of the Chesterfield Gas and Water Company, is the London Agent, at 34, Victoria Street, Westminster, for castings—are carrying out, at a cost of £250,000, a large extension of their iron-works and pipe foundry, which will materially increase an output of an already immense aggregate. We understand that it has been difficult for the Company to keep pace with their increasing business, especially in large gas and water mains, cylinders, and the like; and it is confidently expected that the structural additions now in progress will enable them to meet all the demands upon their plant.

At St. Matthew's Church, Redhill, last Thursday, the marriage was solemnized of Mr. James Paterson (eldest son of Mr. R. Ormiston Paterson, of Cheltenham), the Engineer and Secretary of the Redhill Gas Company, with Miss Margaret Kathleen Peat, youngest daughter of Mr. G. Wallace Peat, of Holly Bank, Redhill. During Mr. Paterson's residence in the district he has made a large number of friends; while the bride's family is held in high esteem. After the ceremony, a numerously attended reception was held at Holly Bank, and subsequently Mr. and Mrs. Paterson left for Switzerland, taking with them a host of good wishes, with which we cordially associate ourselves, for their future health and happiness. Among the numerous presents were a canteen of cutlery from the Directors, a silver bowl and plinth from the accountant and secretarial staff, and a dozen silver teaspoons and sugar-tongs from the engineering staff and workmen, of the Redhill Gas Company; and a Chippendale Sutherland table from officials of the Cheltenham Gas Company.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 796.)

BUSINESS on the Stock Exchange last week showed no improvement either in point of activity or in buoyancy. It was settlement week; and that militated against fresh business. But the account was a light one, and went through without difficulty. A favourable incident was the launching of the Irish Loan, which was applied for about ten times over; but this was not to be wondered at, seeing that the subscription price made it rather a cheap lot. A disagreeable factor was in the shape of Russian affairs, which exercised a flattening influence outside their own bonds. For the rest, pretty well everything was dull; and taken all round there were more sellers than buyers. In the Money Market, there was at first a little stiffening up in view of Stock Exchange requirements; but the supply proved superabundant, and the market became quite easy. Discount rates held firm for some days, but gave way before the close. Business in the Gas Market was decidedly lighter than it had been for some weeks past, owing principally to a cessation of the animated dealing in the big Continental issue. Indeed all the chief issues were below their average in point of activity; and the united aggregate of the little over could not make up much of a show. However, the general tendency was steady and good. Hardly a quotation moved; but the few changes noted were all in the right direction. Debenture stocks gave a little indication of improved strength. In Gaslight and Coke issues, the ordinary was lightly dealt in each day at about the same figures; transactions never ranging outside the limits of 97 and 97¾, and by far the larger part of them being done at the higher figures. The secured issues did not compensate for the inactivity of the other. The maximum changed hands at from 87¾ to 89; the preference at 110⅓; and the debenture at 87⅜ (with a rise of 2 in the quotation). South Metropolitan was quiet and devoid of feature—what few transactions were marked being done at between 128 and 129. The debenture was dealt in at prices ranging from 87½ to 89. There was more doing in Commercials than has been the recent average, and prices were steady. The 4 per cent. changed hands at 114 and 114½; and the 3½ per cent. at from 110½ to 111½. The debenture was quoted 1 higher *ex div.* The Suburban and Provincial group were more active than usual. Alliance new marked 14⅜, Bournemouth "B" 17¼, Brentford old 268, British 42¾, South Suburban preference 129. On the Provincial Exchange, Shrewsbury's quotation was narrowed in to reasonable figures. In the Continental Companies, Imperial had a quiet week, with a slightly easier tendency; transactions marking from 179 to 177½. European part-paid was done at 18⅝ and 18⅞. Union was not dealt in. Among undertakings of the remoter world, Bombay changed hands at 6 15/16, ditto new at 5 and 5¼, Cape Town at 16⅜, Buenos Ayres at 12⅜ and 12 7/16, ditto debenture at 98½ and 99, Primitiva at 6¼, ditto preference at 5⅛ and 5⅜, River Plate at 12½ and 12¾, Monte Video at 11⅝, and San Paulo at 13⅞ and 14.

The closing prices are shown in our Stock and Share List on page 796.

NOTES FROM WESTMINSTER.

THE work in the Committee rooms has had a tame beginning after the recess; and there is very little to report upon. Other than the matters dealt with below, the only point of interest is that the Removal of Sulphur Restrictions Bill was read a third time in the House of Lords on Friday.

Gas Lands and Railways. Resuming their sittings on Tuesday, to further consider the London Outer Circle Railway Bill, the Committee presided over by Sir J. Doughty learned from Mr. Erskine Pollock, K.C., that the Brentford Gas Company had withdrawn their opposition to the scheme pending the consideration of a clause submitted by the promoters in respect of the land required by them at the Southall Gas-Works. The clause, Counsel announced, would be without prejudice to the right of opposition if the Bill reached the House of Lords.

L.C.C. Electric Supply Bill. Last week brought us within sight of the end of the consideration of the Electricity Bill of the London County Council by the Hybrid Committee. Mr. Balfour Browne, K.C., and his witnesses on behalf of the North Metropolitan Supply Company on the one hand, and a combination of fourteen of the London Electric Supply Companies on the other, monopolized (and profitably so) the whole of Tuesday and Wednesday's sittings. The gravity for the Companies of the position projected by the County Council scheme and their suggested controlling powers, is shown by the fact that the Companies have alone an invested capital of £12,622,633; and they are going on the correct lines to achieve for the consumers a success equal to anything that the London County Council scheme will afford, notwithstanding the price-revision powers. There has been a tremendous increase in the aggregate business of the Companies since 1893; and from that year the average price per unit has been reduced from 6·22d. to 3·24d. last year. This is substantial proof of the right course having been taken, and that it will continue to be taken, without the interference of the London County Council. The Companies have collectively approached the Board of Trade in the matter by way of a petition, pointing out that the advantages of cheap generation of electricity could speedily, and at a relatively small addition to capital, be given throughout the whole of London if Clause II of the Supply of Electricity Bill, about which we have heard a great deal in previous sessions, were proceeded with; and the Board have announced that they are considering the expediency of reintroducing it. This looks healthy. Perhaps the Board are not now so enamoured of the County Council scheme as they were in the flush of victory at the opening of the new Parliament, and when the word municipalization had almost an intoxicating influence on the new members. The Companies are desirous now of helping one another by an intercommunication scheme. All this was explained to the Hybrid Committee; and no less an authority than Sir Alexander Kennedy has assured the Committee that he is of opinion that the Companies could adequately meet the requirements of London so far as their own areas are concerned, and that, with the removal of the legal disabilities under which they now labour, the whole of London could be provided for on terms equal to those proposed in the County Council Bill with much less expenditure. If this is so, then there is no need for the waste and speculation proposed by the County Council. There was one point in the evidence of Mr. Sparks, the Chief Engineer of the County of London Electric Supply Company, which throws a little light on the competition for power. He admits that in London there are practically speaking, no large power users; for the average horse power of the power consumers on the mains of the City Company, the Charing Cross Company, and the County of London Company is only 7½, and on the County of London mains alone (which Company have one-third of the power in its district) it is only 5½-horse power. The difficulty of securing custom for power purposes against the competition of gas, &c., is shown by an instance in which he quoted 0·4d. for a 700-horse power consumer with a load-factor of 66 per cent., and yet failed for this reason. On Thursday, Mr. Ralph Littler, K.C., laid before the Committee the case for the City Corporation, who anticipate that the scheme instead of producing advantages will yield burdens. The Committee wound up the sitting by hearing Mr. Freeman, K.C., reply on the case in opposition to the Bill; and then there was an adjournment until to-day. The Committee will on reassembling have before them independent expert evidence; and their diary for the week also includes engagements to make a journey to Greenwich on a County Council steamer to inspect the generating-station there (perhaps they will also take a passing look at the Observatory), and to hear witnesses on behalf of the Admiralty and the Board of Trade.

Power Electricity Companies. The misfortunes of the Electricity Power Companies are occasionally heard of in the Committee rooms; and the one and only success is trotted out with such frequency that it gets a bit tiring. We have heard indirectly of the troubles of the South Wales Electrical Power Company, who are at work, and who are only expecting—nothing more—to be supplying some 14,650-horse power by the end of the present year. They have presented a petition for the insertion in the Bill promoted by them of an additional provision regarding money powers; but, when the measure came before the Examiners on Monday, it was decided that the Standing Orders had not been complied with, as the additional power was not inserted in the original notice. The matter will, therefore, have to go before the Standing Orders Committee. The petition, however, that was presented shows the uphill work the Company have had, and must have, in the future. The demand for power has developed very slowly; and it is confessed that it must be "some time" before the receipts will be equal to the outgoings. In the meantime, further capital is urgently required to lay down additional plant and machinery and to meet the current liabilities. Engineers who have been instructed by some of the largest shareholders to inquire into the position, have made a report in which they state that a further capital expenditure of not less than £270,000 is requisite; and with such expenditure it is anticipated that in 1909 the Company will be earning profit at the rate of £26,000. To so bad a pass has the Company come, that it is found impossible to raise the necessary money unless the Company are empowered, in addition to the share capital sought in the Bill, to raise a sum not exceeding £500,000 by the issue of prior lien debenture stock. Only by getting this power will the Company be saved from disaster; but it is a question whether the ordinary shareholders do not already feel themselves in the midst of disaster. The market quotation of the Company's £10 shares is down to 3-3½. What it will be with prior and extra debenture stock in front of the claims of ordinary shareholders, it will be of interest to see later on. But it is a pity that Parliament has been in the past so free in giving huge powers to such Companies before there has been satisfactory demonstration that the concerns are required.

On Wednesday, the 6th inst., the marriage took place of Mr. Alfred J. Hope, the Gas Engineer to the Borough of Nelson, to Miss Ruth Hetta Nelson, eldest daughter of the Mayor. Among the many presents received by the happy pair was a silver salver from the officials of the Corporation.

THE LEEDS CORPORATION INSPECT THEIR NEW GAS-WORKS PLANT.

THE Leeds Corporation Gas-Works have not been exempt from the common experience of the gas industry that, notwithstanding the competition of electricity and the economy-producing incandescent mantle, works' reorganization and reconstruction and extension have been from time to time imperatively called for. The work at Leeds has been heavy in these directions over the past twelve or thirteen years, as the plant itself and the capital account of the concern confirm. For the Gas Committee, for the General Manager (Mr. R. H. Townsley), for the Station Managers, and for the staff generally, this has produced plenty of work and anxious times; and the officials have in consequence had to apply themselves unremittingly to their duties. It is in accordance with the fitness of things that councillors whose votes have to endorse policy and expenditure should periodically pay a visit of inspection to see what has been obtained for the money expended. We believe there is nothing that is so conducive to smooth working in connection with a corporate body as placing in the open light before the whole of the councillors—subject to the interests of the undertaking being preserved—the doings and possessions of the department concerned. Such action may produce a little unintelligent criticism; but for the greater part it encourages support. That is the belief of the Leeds Corporation Gas Committee; and though there have been long intervals between the visits of the Council, there are expectations that the good that is wrought will secure a narrowing of future intervals.

It was on the invitation of the Chairman of the Gas Committee (Mr. George Ratcliffe), the Deputy-Chairman (Mr. Edward A. Hirst) and their colleagues, Alderman Ewing Matheson, C. F. Tetley, J.P., and Ambrose E. Butler, J.P., and Councillors H. Brown, J. Hudson, B. G. Heald, J. Lubelski, J. H. Barraclough, R. Armitage, M.P., and R. P. Beckworth, that last Tuesday the members of the Corporation visited two of the stations for the purpose of inspecting the important extensions that have been made since their last visit. Unfortunately, indisposition prevented the Lord Mayor (Mr. Edwin Woodhouse, J.P., D.L.) taking part in the visit; but, as will be seen, he joined the large company later in the day. There were several guests, too; prominent among them being Mr. E. Edwards, the Chairman of the Leicester Corporation Gas Committee, and Professor Smithells, of the Leeds University. The visitors were accompanied by the chief officials of the department Mr. R. H. Townsley (General Manager), the Works' Managers, Mr. H. Hulse (Meadow Lane station), Mr. R. N. Webb (New Wortley station), Mr. W. E. Pettigrew (York Street works), and Mr. W. Hole, the Superintendent of the Mains Department.

PRELIMINARY INFORMATION.

Before dealing with the new plant at the Meadow Lane and New Wortley works to which the visits were confined, there is a little preliminary information that may with advantage be given. The last official visit of the City Council to the works took place on Oct. 17, 1898; and since that time, changes have occurred not only in the works, but in the constitution of the Gas Committee. The number of members has been reduced from 22 to 13, including the Lord Mayor in both cases. Of the 22, thirteen are no longer members of the Corporation; three have seats on the Council, but have ceased to be members of the Committee; two have died—the only remaining members being Mr. Ratcliffe (the present Chairman), Alderman Tetley (then Lord Mayor), and Messrs. Heald and Brown.

At the time of the visit of the Council in 1898, although a large proportion of the gas was produced by mechanical means, hand-stoking was in vogue entirely at York Street, at the two old retort-houses at New Wortley, and in the case of practically one-half the retorts at the Meadow Lane works. Having regard to the successful working of the inclined retorts at Meadow Lane since the year 1897—and for which a word of praise must be given to Mr. Hulse, the Manager, whose results have been most uniform and averaging 11,000 cubic feet to the ton for eight years—the Committee decided to further extend the system. In 1902, a new inclined installation was completed at York Street works; and two years later a larger house was erected at the New Wortley works. In addition to this, a carburetted water-gas plant has been erected at the Meadow Lane works, together with a new purifying-house and lime-shed to deal with the gas produced by the plant. With a view of utilizing certain of the waste products—such as gas lime and clinkers—the Committee have recently instituted a plant at the New Wortley works for the manufacture of slabs and bricks for building purposes.

The price charged for gas at the time the undertaking was transferred to the Corporation in 1870 was 3s. 6d. per 1000 cubic feet. At the present time, the price is 2s. 3d. per 1000 cubic feet for all purposes. But by a recent resolution, the Council have decided that after July 1 next, the prices shall be reduced as follows: To consumers by ordinary meters within the city, from 2s. 3d. to 2s. 1d. per 1000 cubic feet; to consumers by automatic meters, from 2s. 6d. to 2s. 4d.; to consumers by automatic meters with cookers, 2s. 9d. to 2s. 7d.; to consumers for power purposes within the city, 2s. 3d. to 1s. 10d.; to consumers outside the city (except for power purposes), 3s. 1d. to 2s. 11d.; to consumers for power purposes outside the city, 3s. 1d. to 2s. 8d. The illuminating power at the same date is coming down to 15 candles, tested in different parts of the district. It will be remembered that the Corporation have power under their last Act dealing with gas to supply down to 14 candles; but they have been going down in easy stages.

The Corporation acquired the gas undertaking from the Leeds Gas Lighting Company, and the Leeds New Gas Company, in 1870, at a cost of £763,224 10s. 4d. Since then, considerable sums have been spent on capital account, and the total capital expenditure, including the purchase money for the undertaking, up to March 31 last was £1,834,930 8s. 5d. As further evidence of the progress of the department, it may be pointed out that the quantity of gas manufactured in the year ended June 30 last was 3,090,155,235 cubic feet, as compared with 2,849,233,000 cubic feet in 1898; while the quantity sold was 2,754,639,200 cubic feet, as against 2,530,952,500 cubic feet. The quantity of coal and cannel carbonized in the year ending June 30 last, including the equivalent of oil used, was 287,847 tons. The total number of meters in use was 111,515, as compared with 58,700 in 1871, and 82,195 in 1891. The number of prepayment meters was 31,272, as against 3472 in 1898. The number of gas-engines was 1119, as compared with 805 in 1898. The number of gas-stoves was 15,576, as against 2889 in 1898. The length of mains was 951 miles, as compared with 772 miles in 1898. The lighting area of the city is about 36 square miles. The present capacity of the whole works is about 20 million cubic feet per day, or $2\frac{3}{4}$ millions more than in 1898.

CARBURETTED WATER-GAS PLANT AT MEADOW LANE.

The members and the invited friends left the Town Hall on Tuesday about 11.30 by special tramcars. It was a beautiful day; and nothing could have been more favourable for a visit, excepting that June is not the month in which to see the works under the busiest conditions. However, the Meadow Lane works were first visited; and there the newest of the plant to be seen were the three carburetted water-gas sets. These were supplied and erected by the Economical Gas Apparatus Construction Company, Limited, together with the necessary washers, scrubbers, condensers, &c. In explaining the plant here as elsewhere, Mr. Townsley and his staff were kept well occupied. Each set of the carburetted water-gas plant has a daily capacity of 900,000 cubic feet, and a total daily capacity of 2,700,000 cubic feet. The first two sets were put down about five years ago; and the third set about eighteen months since. The plant finds habitation in a part of the old coal-store, which has been divided by a substantial brick wall. In its renovated and converted condition, the part of the store allocated to the purpose makes a splendid house for the plant, and leaves plenty of room for operation and extension. The generator room contains the generator, superheater, fixing chamber, washer, and oil-heater. Each generator is lined with fire-brick and asbestos, and has its complement of blast-valves, water-cooled gas-valves, and steam-injectors. A combined superheater and fixing chamber is attached to each generator, of a total height of 38 feet, formed of $\frac{5}{8}$-inch steel plates, and lined with fire-blocks and non-conducting material. On the sides of the superheater are fixed the oil-injectors, which are placed at an angle to effectually meet the up-coming gas from the generators, thereby ensuring the thorough cracking-up of the oil. The oil is forced into the machine through a copper coil placed in the gas down-take pipe from the washer, by a pump fixed in the engine-room being so arranged that the gas imparts some portion of the sensible heat to the oil before entering the injectors. At the top of the fixing chamber is a valve-controlled outlet for the blast products. There is in connection with the generator room a hydraulic lift worked by town water pressure for raising the coke from the ground floor to the charging-stage.

The condensers and scrubbers are fixed outside the generator house, together with the tar-separator, tar-well, and effluent-water tank. The condensers are of the cylindrical water-tube type, 6 feet diameter by 22 feet high, divided at the bottom into two compartments, so that the gas passes up on the one side through a series of tubes, and down again on the other. Each condenser has a total cooling surface of about 3000 square feet. The scrubbers are 6 feet diameter cylinders, 22 feet high, fitted with wooden trays and a sprinkling apparatus; the effluent water being used for this purpose.

Adjoining the generator-house is the machinery room; and this contains the machinery required for the generating sets. There are two vertical high-speed Tangye engines, speeded up to 300 revolutions per minute. Each drives a Sturtevant fan, and produces an air pressure equal to about 18 inches water column. There are two combined engines and exhausters of 80,000 cubic feet per hour capacity. Six duplex pumps—two for oil, two for condensing purposes, and two for water to cool the valves—are also in this room.

The boiler-house which also adjoins the generator-house contains two Lancashire boilers, 8 feet diameter by 30 feet long, having a working pressure of 125 lbs. per square inch.

In connection with the plant is an oil-storage tank, 35 feet in diameter by 30 feet high, of about 180,000 gallons capacity; and a three-lift relief holder, 60 feet diameter, with steel tank of

545,000 cubic feet capacity. The oil used is brought into the works by tank waggons belonging to the Corporation, and is forced into the storage tank by an air-compressor.

The purifying-house and lime-shed were erected in 1904. The structure, which is entirely of steel, contains three purifiers, each 43 feet square. The purifiers are built on a stage-floor, with head room for carts to run underneath to remove the spent material. The boxes are luteless; and in this particular they differ from the purifiers erected at the other stations. There are six covers to each purifier, fitted with Clapham's patent "Eclipse" rubber joint and rapid automatic fasteners. For raising the covers and filling the boxes with lime, a crane is provided worked by hydraulic pressure.

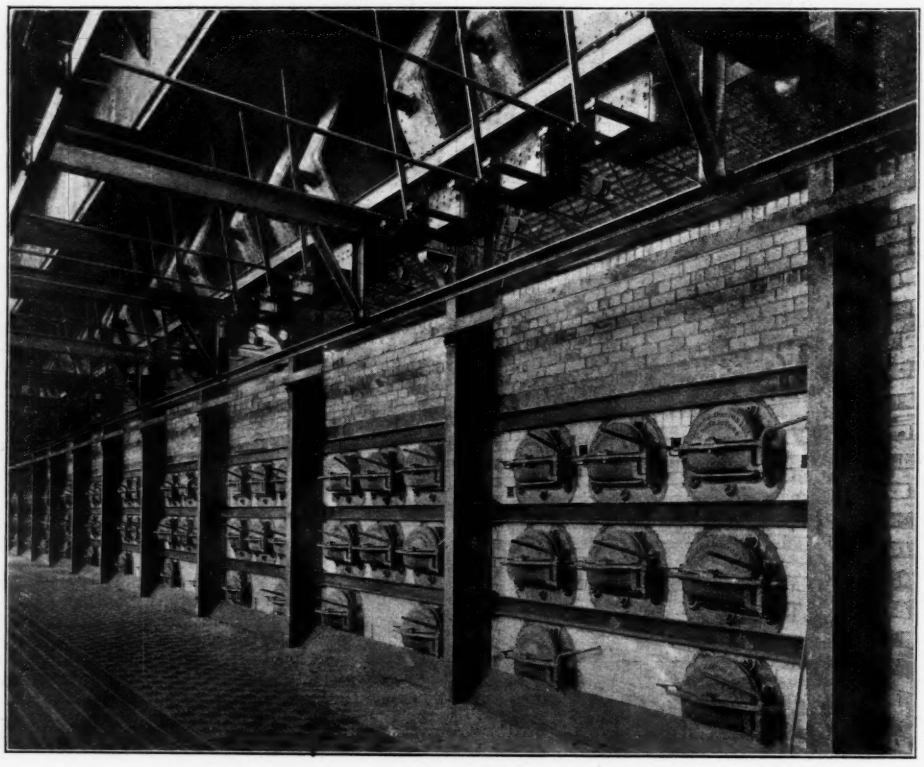
All these things created a great deal of interest among the visitors, who were considerably attracted by the charging of the generators, and by the smooth running of the Tangye engines and Sturtevant fans.

Quitting the Meadow Lane works, the party were next conveyed by the special tramcars to the New Wortley station, where there was more interest awaiting them.

THE NEW INCLINED RETORT-HOUSE.

The modern extension of greatest importance is at these New Wortley works; and it consists of the installation of inclined retorts in an adapted house of 290 feet long by 70 feet wide, built throughout of red brick. It is in this house that outstanding interest lies for gas engineers, as it did for the city councillors. We need not say more than that they were greatly attracted by the ease of charging and discharging. The charges came out clean and uninterruptedly with the slightest assistance by the man on the discharging-floor; and they were well burnt off—the heats being of the character that admits of no adverse criticism. The complete installation was adopted after the commending experience with inclines at the other stations; and the whole work was executed, under the direction and supervision of Mr. Townsley, by Messrs. Graham, Morton, and Co. The house contains two benches, each of eleven settings of eight retorts; the dimensions being 24 in. by 15 in. at the bottom, tapering to 20 in. by 15 in. at the top, and 20 feet long, set an angle of 32°, with 1 ft. 6 in. walls and piers. The arches are 11 ft. 6 in. centre to centre, by 17 ft. 1 in. on the horizontal. They are semi-circular, and constructed of two rings of 4½-inch arched bricks, moulded to the required radius. At the top and bottom of the arches are channel irons, held in position by the buckstays, and forming a support for the arches. The main flue has a semi-circular arched top, 9 inches thick. The end buttresses are built of solid fire-brick. The furnaces are those known as "Graham's patent inclined retort furnace," on the regenerative principle, and are similar to those installed at the other stations of the Corporation; the total number of Graham's furnaces now erected in Leeds, being 62. The furnace is constructed in front of the lower portion of the bed; the generator being charged from the discharging-stage. The clinkering operations are performed beneath, on the ground floor. There are two chimneys, 120 feet high, one for each bench of retorts.

There is no necessity to refer in detail to the furnace fittings.



The New Retort-House at the New Wortley Gas-Works—The Charging-Stage.

But it might be mentioned that the body of the cast-iron furnace frames and doors is of 1-inch metal; and the size of the frame inside is 16 inches square. The bodies of the doors are of 1-inch metal; and ribs are cast inside, 1 inch thick. The overall dimension of the cast-iron clinkering frames and doors is 3 ft. 1 in.

The secondary air-boxes (numbering 88) are 6 in. by 3 in. by 4 in. deep. The wrought iron furnace-bars are 2 inch square by 5 ft. long; and the bearer-bars are 2 in. square by 3 ft. long. The drip plates are 3 ft. 6 in. long by ½ in. flat iron; and the troughs are made of angle-bars, 3 ft. 2½ in. long by 2½ in. by ⅜ in.

Regarding the retort-fittings, the top mouthpieces are 20 in. by 15 in. by 3 in. deep, ⌂ shaped, provided with a self-sealing lid with eccentric fasteners. The bottom mouthpieces are 24 in. by 17½ in. by 16 in. deep. On the floor of the mouthpiece is bolted a square-headed bolt, which projects above, and forms a bearing for the coal stop to rest on, instead of bearing against the mouthpiece lid.

The ascension-pipes are 7 inches in diameter, about 12 ft. 6 in. long. The bridge-pipes are 7 inches diameter, and are provided with three cleaning-out branches. The hydraulic regulating seal valves are of an improved pattern, with 8 in. by 14 in. openings. The tar-pipes, including the drip pipes, are 6 inches diameter, and run to about 312 feet; the whole having a fall of ½ inch in every 11 ft. 6 in. The tar-pipe falls over the end of the bench, and connects to a syphon pot. The hydraulic main is separate for each bed, and is 2 ft. 6 in. wide by 1 ft. 8 in. deep. The steel foul main consists of twenty-two lengths, 24 inches in diameter, 11 ft. 6 in. long.

Turning to the bench ironwork, the front steel buckstays, of which there are 24, are 16 in. by 6 in. H section. On the front flange, provision is made for carrying the drawing-stage and also the coke shield brackets. The back buckstays are of the same number and dimensions as those at the front. These are fixed at a distance of 11 ft. 6 in. centres of beds and end walls. The cross-stays and stiffening joists are attached, and on the front flange are also fixed the charging-stage joists. The secondary transverse joists for carrying the measuring-chambers are also attached; and at the upper end of the back buckstays a suitable bearing is provided to carry the main transverse joist or girders. The end buckstays number 16, and consist of 16 in. by 6 in. rolled steel joists. They are strengthened by a 12 feet flitch-plate, ¾ inch thick, rivetted on either side. The staircases, of which there are three (one in the centre and one at each end of the house), are attached to the buckstays. They are made of channel iron, and cast-iron treads. The cross-stays, stiffening joists, tie-rods, and girders do not call for particular mention; but it may be stated that support for the measuring-chambers is afforded by means of four complete lengths of joisting. The rails for the shoots are in two lengths, formed of 4-in. by 4-in. by ½-in. T steel; each length being 300 feet.

Passing to the charging-shoots, measuring chambers, coal-bunkers, and drawing and charging-stages, the first thing to be noted is that there are four complete sets of charging-shoots, comprising three separate lengths. In all there are 66 measuring-chambers; each being fitted with double slide and levers. The dimensions are 5 ft. 8 in. deep by 1 ft. 6 in. wide; and the capacity 7 cwt. The lower part of each measuring-chamber is fitted with Graham's patent "sure-feed."

The two coal storage bunkers run continuously the entire length of the bench and retorts; the body and frame being arranged in eleven bays 11 ft. 6 in. centres, and 8 ft. wide inside dimensions, and 8 ft. deep overall. On the bottom of the tank, a steel plate is bolted; and in this, provision is made for three outlets for filling the measuring-chambers, which are attached to it. Each hopper has a capacity of about 120 tons. A gangway runs round both ends of the hoppers, connects up to the staircases, and also runs across from one bench to the other at the centre of the retort-house, so that the workmen have easy access to the push-plate conveyors.

Coming now to the stages, they run the full length of the house; the charging-stage being 18 ft. 6 in. wide, and the drawing stage 20 ft. wide. The main transverse girders for the drawing-stage are 24 in number, 12 in. by 6 in., of H steel section, and about 20 feet long. One end is attached to the front buckstay by angle-iron cleats and wrought-iron brackets, and the other end rests upon columns. It will be understood from this that the drawing-stage does not occupy the whole of the space between the face of the bench and the front wall of the retort-house. The columns are 8 inches outside diameter, at bottom, tapering to 7 inches at the top. Twenty-six handrail standards, with tubing, enclose the drawing-stage. Twenty-two of the longitudinal girders are of channel steel, 10 in. by 4 in., and about 11 ft. 6 in. long. These form the outer edging of the stage, and are fastened to the main girders, at 11 ft. 6 in. centres, by angle-iron cleats. There are also 66 longitudinal girders, 6 in. by $4\frac{1}{2}$ in. H steel, about 11 ft. 6 in. long; each end being attached to the main girders by wrought-iron cleats. The main transverse girders for the charging-stage are bolted to the buckstays at one end, and built into the wall at the other. The longitudinal girders number 88; and the dimensions are 6 in. by 5 in., H steel section, and 11 ft. 6 in. long. The floor-plates are of $\frac{3}{4}$-inch metal in the body; and the flanges are $\frac{7}{8}$ inch thick. They have a basket-shaped pattern cast on and raised about $\frac{1}{4}$ inch.

Attention has now to be turned to the automatic coal-handling plant. The whole of the elevating and conveying plant is in duplicate; and each elevator and conveyor is capable of handling 40 tons of coal per hour. Each of the two receiving-hoppers is 8 ft. square, by 5 ft. deep, and is supported by means of 12 in. by 6 in. steel joists in the pit. In each hopper is arranged a suitable jigging feeder, consisting of a steel tray, provided with 3 inch by $\frac{5}{8}$ inch taper screen-bars pitched 2 inches apart, so as to screen the coal which is bye-passed into the elevator boot, without passing

The New Retort-House at the New Wortley Gas-Works—The Discharging-Stage.

through the crusher. The moving tray receives its motion by means of two eccentrics mounted on a 3-inch diameter shaft, driven by the usual gearing from the crusher countershafts. Under each screen is arranged a bye-pass shoot, for conveying the screened coal falling from the shakers into the elevator boot, without passing through the crusher.

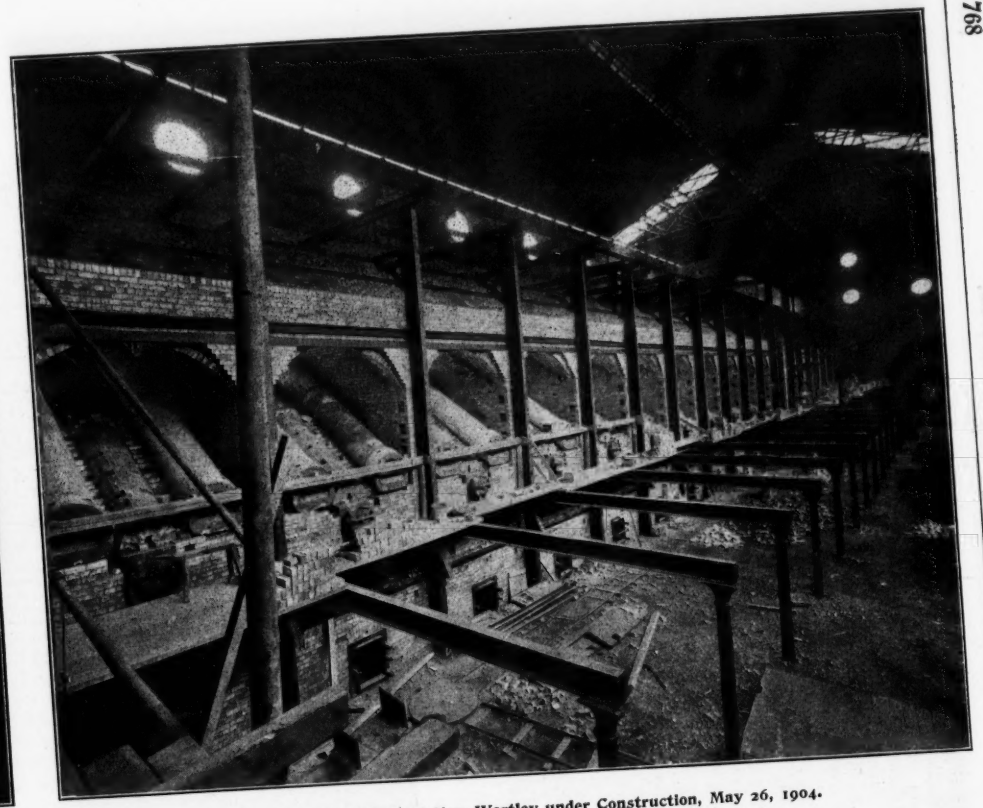
The coal and cannel breakers are of the revolving type, with strong massive cast steel claws, 18 inches diameter on the top shafts and point, and ratchet toothed rollers, and 16 inches diameter on the bottom shafts. The bearings are of gun metal, and fitted with Stauffer's lubricators. The crushers are each capable of crushing 40 tons of coal or cannel per hour; and each is arranged complete with independent gearing, and driven from the main countershaft. Under each breaker is arranged a second shoot for delivering the crushed coal into the elevator boot.

The elevators are of the twin, cased-in type, 80 feet centres, and each capable of raising 40 tons of coal per hour. The two are built up in one frame, with a $\frac{5}{16}$ inch division-plate. Each elevator is provided with a double strand of 6-inch pitch steel roller chain, to which are attached 24-inch wide rivetted steel buckets. The angle-iron runners of the elevator are provided with renewable iron skidder-bars, securely bolted to the angle-iron runners. The elevator boot is of $\frac{3}{8}$-inch steel plate sides, and $\frac{3}{8}$-inch steel wrapper plates.

The four push-plate conveyors are each 20 inches wide, and about 135 feet centres, of the latest design, with a double strand of steel chain, 6 inches apart. The push-plates are of $\frac{3}{16}$-inch steel plate, provided with an angle-iron skidder-bar fitted to two steel chains 24 inches apart, and capable of conveying 40 tons of coal per hour. The troughs are of the ordinary design. The frame carried through the trough consists of angle-iron uprights, angle-iron runners, and flat bar cross-bracing, and greenheart wood renewable guides. These hard wood runners are on the guides on the trough, as well as on the upper guides. To feed from the elevator to the push-plate conveyors, there is a double breeches shoot, so that the coal may be delivered from either elevator into any of the push-plates.

The gearing for driving the plant consists of a main countershaft, driven direct from the engine by means of the usual belt pulleys and belting. [There are by the way two gas-engines of 70 brake horse power, each capable of driving the whole of the coal plant.] From off the countershaft is driven a vertical shaft. From the main countershaft is also driven a line shaft at the centre of the retort-house for driving the coal crushers and feeders. The power is transmitted from this shaft on to a cross-shaft (in the crusher pit), which drives the crushers and feeders by means of belt gear. On this shaft is arranged a system of sprocket wheels with claw-clutches for driving the elevator and the conveyor. Each conveyor, elevator, and crusher, is so arranged that it may be run independently.

The Charging-Stage at New Wortley under Construction, May 19, 1904.



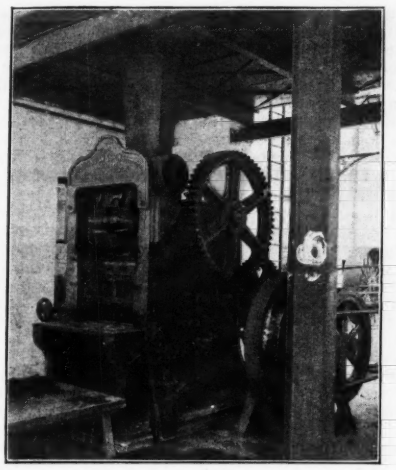
The Discharging-Stage at New Wortley under Construction, May 26, 1904.

Mr. Townsley has, by experience in working, now fully satisfied himself as regards to the erection and workmanship. We are therefore able to compliment him on the scheme, and also Mr. Maurice Graham, who represented the Contractors, on the manner in which the contract was carried out.

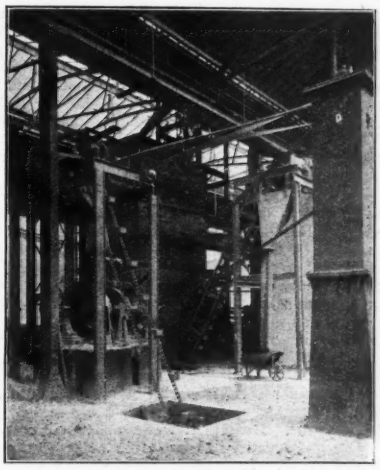
BRICK AND SLAB-MAKING PLANT.

The problem of how to remuneratively utilize spent lime and clinker is in a fair way of being solved at these works by the conversion of these formerly waste materials into bricks and slabs of splendid quality. All the gas at Leeds is purified by lime; and therefore the Committee have hitherto had a large bulk of the spent material to dispose of annually. Upon this and the possible saving, the Chairman of the Gas Committee grew quite eloquent in a speech that he made later in the day, as reported subsequently. The plant is a substantial one that has been put down for this purpose; and we cannot help congratulating the Gas Committee and the Corporation upon having the courage to expend a substantial sum to put to practical test their convictions as to waste being turned to profit. Thus only is progress made; and those responsible for such an important gas undertaking as the one at Leeds have a duty to assist in doing those things which contribute to the general progress. If the product is anything to go by without reference to cost (about which we do not know anything at present), the success of the system is assured. The bricks are hard and tough; and they will stand a greater crushing strain per square foot than ordinary red bricks. Their resisting quality too is excellent. Courses of these bricks, it may be remembered, were incorporated in the furnaces of the inclined settings just described; and there has not been the slightest trouble with them. In front of the pay office at the New Wortley works, too, slabs made from spent lime and clinker have been subject to a three years' trial from the heavy boots of the men; and so hard are the slabs that there is hardly a scratch upon the surface. There are great possibilities here if price is not a bar; and, so far as we can gather, it is not. However, that is a matter for further inquiry. The system of working up these waste materials, it will be remembered, was developed by Aldermen Lowden, formerly the Chairman of the Gas Committee, and Mr. John Bond, erstwhile Manager of the New Wortley works, now Engineer to the Southport Corporation Gas-Works.

The plant is most interesting. It is compact, complete, and substantial. The process is simply this: The gas lime is passed through a breaker, then mixed with clinker, elevated into a kiln, and calcined at an intense heat for a period of 18 hours. The heat is obtained by means of a producer and the admittance of air at different parts of the kiln. After calcination, the material is taken from the kiln, spread on the floor, allowed to cool, and is then thoroughly slaked. It is then passed into a pulverizer, very finely ground, and conveyed into the mixer, where it meets further clinker from the grinding-pans. The material is next passed into a 9 feet tempering-pan, thoroughly tempered and elevated over the press ready for brick-making. The press produces two bricks at once, and will make 1000 bricks per hour. After being made,



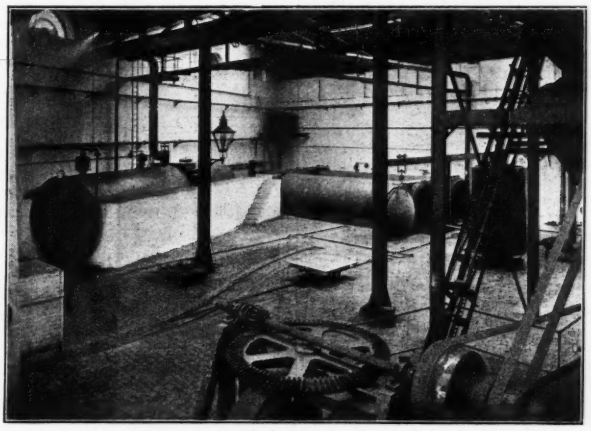
The Brick Press.



The Kiln, the Pulverizer, and the Elevator for the Calcined Material.

the bricks are placed on flat steel platform waggons, and run into the autoclaves where they are steamed for fourteen hours at a pressure of 120 lbs. per square inch. They are then brought out of the autoclaves, allowed to cool, and are ready for use. The plant is rope-driven; the power being obtained by a 16 inch by 30 inch high-pressure steam-engine. The steam required for all purposes is generated by a 30 ft. by 8 ft. Lancashire boiler, fitted with forced-draught furnaces. It may be mentioned that some portions of the plant would not be necessary in future installations; and therefore the cost would be materially reduced.

The visit of the Council was chiefly directed to the inspection of the new plant; and when the members and their guests had exhausted the interest to be derived from the charging and discharging of inclined retorts and the mechanical and other operations associated with the production of bricks from spent lime and clinker, and satisfied themselves as to the homogeneity and strength of the bricks by a series of practical if unscientific tests, they left the works, and were again conveyed back to the Town Hall, where the Lord Mayor (Mr. Woodhouse), received them. Succeeding was luncheon, which was served in the Lord Mayor's rooms; and round the festive board, all external differences were sunk and concord prevailed.

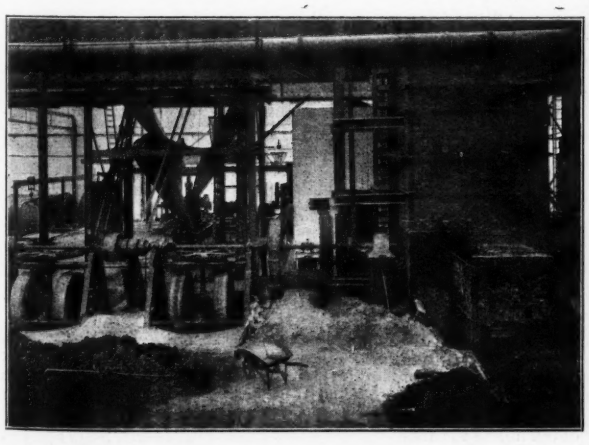


The Boiler, Autoclaves, and Grinding Pans.

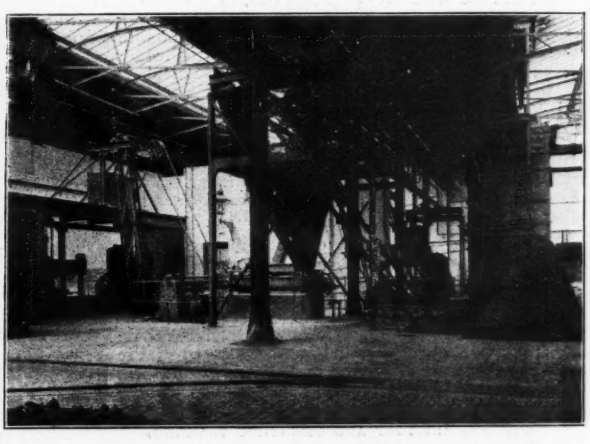
REMINISCENCES—IN THE TIME OF MR. HENRY WOODALL.

After luncheon, a number of toasts were indulged in, in addition to those expressive of the loyalty of those assembled to the King and Royal Family.

In proposing "Success to the Gas Committee," the Lord Mayor became reminiscent. The event called to mind that 25 years ago he was a member of the Committee; and he recognized that since then many things had happened that had affected the fortunes, for good or ill, of the industry. At that time, they were charging about 5d. per 1000 cubic feet less than now—1s. 10d. as against 2s. 3d. At that time, Mr. Henry Woodall was the Engineer and Manager. He was a member of a very interesting family; and Mr. Woodall as the Manager of their gas-works was a very interesting personage. He (the Lord Mayor) heard in the Gas Committee of those times the most instructive discussions that ever took place. In 1883-4 gas was charged at 1s. 10d. per 1000 cubic feet, and residuals got to higher prices than had ever been received before or had probably ever been received since. They had then a good many gas managers on the Committee—Mr. Woodall being only one of them. [Laughter.] Mr. Woodall was an educated man; and he had ideas. One of the members (Mr. Sparke) was always fighting for illuminating power; and illuminating power Mr. Woodall said was a fallacy; and, moreover, that too much purity was not good for the health. He (the Lord Mayor) believed the contention was that microbes were killed by having what was vulgarly called impurities in the coal gas. However, there was no mistake about it that, notwithstanding the advent of electricity, they did still rely on gas for the greater part of the city lighting. Improvements had been made in manufacture; and about 1200 cubic feet more gas per ton of coal were being produced than during the years of which he was speaking. But coal then cost 7s. to 8s. odd per ton, as against 11s. to 12s. now. But wages were now higher, hours of work were less, and generally the conditions of the men at the gas-works had improved. Mr. Woodall's great theory in those days was that gas ought to be made to cost the ratepayers nothing—that with coals at a reasonable price, with advances in scientific manufacture, with



The Grinding Pans (Autoclaves at the Back), Mixer, Brick Press, Engine-House, Kiln, and Producer.



The Brick Press, Tempering Pan, Mixer, Kiln, and Grinding Pans.

residuals increasing in value by leaps and bounds, they ought to make gas at no expense beyond that of distribution. So far as his (the Lord Mayor's) imperfect judgment went, Mr. Woodall always proved it would come all right in the end. He made out that residuals would cover the expenses. But residuals were then at much higher prices, and coal was much cheaper, than now; and no doubt Mr. Woodall came to the conclusion that those results ought to be brought about provided all things prospered for the gas industry in the way they were doing then in connection with the residuals and coal markets.

CHANGED CONDITIONS.

An interesting speech was made by the Chairman of the Gas Committee (Mr. George Ratcliffe), in responding to the toast. He refused on this occasion to be drawn into statistics by what the Lord Mayor had said; but he did emphasize the point as to the great difference in the cost of coal and the reduced value of residuals as compared with the time when gas was sold in Leeds at 1s. 10d. per 1000 cubic feet. He had made inquiries as to why the Gas Committee had to pay £40,000 more now for coal than they would have to do if the prices of some years ago now ruled. He was informed that the advance of 3s. per ton was permanent, because of higher rates and taxes and the higher wages paid to the miners. If it were not for this additional cost of coal, with their present price for gas, they could make something like £70,000 of clear profit. Despite the cheapness of coal, in several of those years when gas was 1s. 10d. per 1000 cubic feet, no profits, but deficiencies, were made. Last year, the Committee had done better than any other Committee had ever done in previous years. Their policy was not only to intend to do better than other Committees, but to beat their own record year by year. He then spoke of the money spent on deputations; and referred to the American deputation now in this country, with a banking account of £100,000 behind them, to find out what were the best methods of gas, electric lighting, and tramway management. In his opinion, it was the duty of any Chairman of any Committee to go anywhere where it was likely that information might be found that would be advantageous. He did not think that the members of the Council all appreciated that the Gas Committee had charge of the most important concern under the Council. Their income was £100,000 a year larger than any other concern at present under the Council's management; and they had nearly 2 millions of capital invested. The members of the Gas Committee felt their responsibilities; and so far as they were able, they intended to make a good show for the ratepayers. The Lord Mayor had also mentioned the price of residuals. Unfortunately, last year was almost a record year for low prices for residuals. Had they been able to get the same price last year as they got two years ago, their profits would have approximated something like £35,000, instead of just over £20,000.

SPENT LIME AND BRICK MAKING.

But there were things in the concern they could control, and that they intended to control, and one thing in particular had reference to the spent lime, which up to the present had always been a waste product, and worse than a waste product, because of the fact that they had had to spend several thousands a year to get rid of it. He found that all over the country the various gas companies and corporations, owing to the difficulty of getting rid of the spent lime, were restricting themselves to purification by oxide of iron. He was sorry to see this. He believed that lime purification was the best, though the costliest, system. In reading his "Gas Journal," he found that many gas companies were getting exemption from the sulphur clauses; and whereas now the Leeds gas contained only from 12 to 14 grains of sulphur per 100 cubic feet of gas, as soon as lime purification was stopped the sulphur mounted up to about 50 grains. He believed that, if the companies and corporations could make something useful out of the spent lime, the larger number of them would prefer lime purification to oxide. In Leeds, they had attempted to solve the problem. The Engineer of the Gaslight and Coke Company (London) had said that it cost them between 3s. and 4s. a ton to get rid of the spent lime; and for the Company this represented an enormous tax, amounting to between £30,000 and £40,000 a year. By the help of his predecessor in the Chairmanship of the Gas Committee (Mr. Alderman Lowden) and the previous Manager of the New Wortley works (Mr. J. Bond), now the Engineer of the Southport Gas-Works, they had done something to solve the problem. As he had said, spent lime had been costing them thousands a year to get rid of; and to dispose of the clinker had cost them something like £1000 a year. Both of these waste products they had succeeded in utilizing by making them into bricks; and the brick they produced was, in his opinion, much better than the ordinary red brick. He was optimistic enough to believe that this very thing would in future have something to do with the provision of cheap houses. They began the manufacture with a clear gain, having brought into use a waste product that used to cost them 2s. to 2s. 6d. per ton to dispose of. They had scarcely got to work yet; and the Committee would not brag about it until they had proved the worth of the system. Not only did he believe this would have some bearing upon the provision of cheap houses, but also upon the price of gas. With a few words as to the responsibility of the Committee, the Chairman ended by saying that it was the intention of the members to show that the money spent on their works was money well invested.

THE MUNICIPALIZATION OF "MONOPOLIES."

"The Visitors" was a toast confided to the capable hands of the Deputy-Chairman of the Gas Committee (Mr. Edward A. Hirst), and Mr. E. Edwards, the Chairman of the Leicester Corporation Gas Committee was the first to respond. He also referred to the advantages of deputations, and particularly to the visit of the American delegates to Leicester, and declared himself as of the belief that all such monopolies as water, gas, electric light, and tramways were better in the hands of municipalities than of private companies. In Leeds, with the gas undertaking the Corporation had a fair success; and he hoped success would be greater in the future.

HISTORY AND SCIENTIFIC TRAINING.

Professor Smithells also made reply, in the first place bearing testimony, as a ratepayer of Leeds, to the great zeal, ability, and unselfishness which the members of the Gas Committee and the members of the Corporation generally worked for the public good. The history of gas supply in the city of Leeds had been one entirely honourable to itself. One of the first proposals for the utilization of gas came from a citizen of Leeds. In the year 1805, a certain Mr. Northern, recorded in the "Monthly Review" an experiment in which he had taken 50 oz. of coal, distilled it, and had obtained an amount of illuminating gas. Such gas he hoped would be turned to use on a large scale for the lighting of factories. This was one of the first recorded instances of a proposal for the use of coal gas, which, as those present knew, found fruition in the splendid work of Murdoch, who in 1814 was the first to light Westminster with coal gas. Only four years later the Leeds Gaslight Company was established. From that time, of course, the gas industry progressed apace. For a long time after the introduction of gas, the changes that were introduced were not very remarkable. Mechanical appliances then began to be introduced; but it was only in comparatively recent times, when the real struggle between gas and electricity began, that the improvements had been made of which they had had witness that morning. No one contributed more, before the incandescent mantle came, than Mr. George Bray in showing how to use gas economically and successfully. Coal gas had found a rival in electricity; and it was through that rivalry that enormous developments had taken place. Nothing was more interesting to an outsider than to look on the battle between the two. Between coal gas and electricity, it was a battle of wits. It was a battle that must be settled by the conflict of trained intelligencies. On behalf of the University he represented, he wished to say that they desired to link their work to the utmost with the practical arts. Their last appointment had been of a Professor whose duty it would be to attend to the great problems of fuel of which coal gas was only one. One could not help thinking that coal gas, whatever might happen, had still an enormous future before it, if not directly for illumination, as an illuminating agent and as a source of power. He hoped this enterprise of the University would receive great sympathy; and that it would be recognized that, in response to the assistance they were already obtaining, they were doing something at the University to benefit those whom they attempted to serve.

CHEAPNESS AND PROFITS.

The health of the Lord Mayor was also proposed; and his Lordship, in reply, urged the members of the Corporation not to worry about the profits from their productive undertakings. He believed in every tub standing on its own bottom; and what they had to aim at was at letting the inhabitants have everything the Corporation supplied as cheaply as possible. He did not see any object in a great craving for showing large profits.

INCLINED RETORT-HOUSE AT THE YORK STREET WORKS.

With the luncheon the interesting day ended; but there is an extension referred to in our opening paragraphs which the Council did not visit, and which to give completeness to the history of recent developments at Leeds ought not to be overlooked. It is the inclined retort installation at the York Street station, which was built by Mr. Maurice Graham. The house itself is 156 feet long, 70 feet in width, and contains a single bench of twelve beds, with a charging-stage 18 feet wide, and drawing-stage 19 ft. 6 in. wide, leaving a clearance at the drawing-stage side of 14 feet—the whole arrangement having been designed with a view to rendering the work of charging, drawing, and clinkering on the best possible conditions for the workman. Each of the arches is 11 ft. 6 in. wide, centres of pier walls, arranged with one continuous main flue connected to the whole of the settings. The main arches are placed at an angle of 32°; and each arch has been set with producers, regenerators, and settings of eight retorts, similar to those at Meadow Lane works. The installation is arranged on the "shot-pouch" principle, consisting of continuous storage tanks placed overhead, with measuring chambers arranged for each set of retorts. There are two sets of charging-shoots; each set consisting of shoots for charging the three tiers of retorts. Owing to the situation of the works, it is necessary for coal to be brought in by carts. It is then dumped into one hopper, under which are placed two massive crushers, with gear for crushing both coal and channel. There are two elevators placed side by side, forming a duplicate or twin framing, and so arranged that either elevator may be worked as required. As the coal is discharged from the buckets of the elevator, it is conveyed by means of an 18-inch wide push-plate conveyor, which stores the coal automatically along the whole length of the coal storage tanks, which are 139 ft. long, 6 ft. wide, and 7 ft. deep, supported upon the superstructure of the bench. The coal-handling plant is capable of dealing with the coal at the rate of 30 tons per hour. Mr. W. E. Pettigrew, the Manager of this works, is obtaining remarkable results, owing to his most careful attention to the golden rule that "profits are made and lost in the retort-house;" and he has evidently made up his mind that any installation placed under his charge shall have his undivided attention, without any bias. Consequently success is the ultimate issue.

The High-Pressure Gas Lighting at the New Victoria Station.—In the descriptive lines under the illustration of the main cock arrangement for controlling the various series of platform lamps and the back lamps under the bridges at the new Victoria Station of the London, Brighton, and South Coast Railway, the devising of the ingenious arrangement was ascribed to Messrs. Sugg and Co. It should have been (as was stated in the article itself) the Gaslight and Coke Company.

THE PAST AND PRESENT OF THE HULL WORKS OF THE BRITISH GASLIGHT COMPANY.

(*Concluded from p. 709.*)

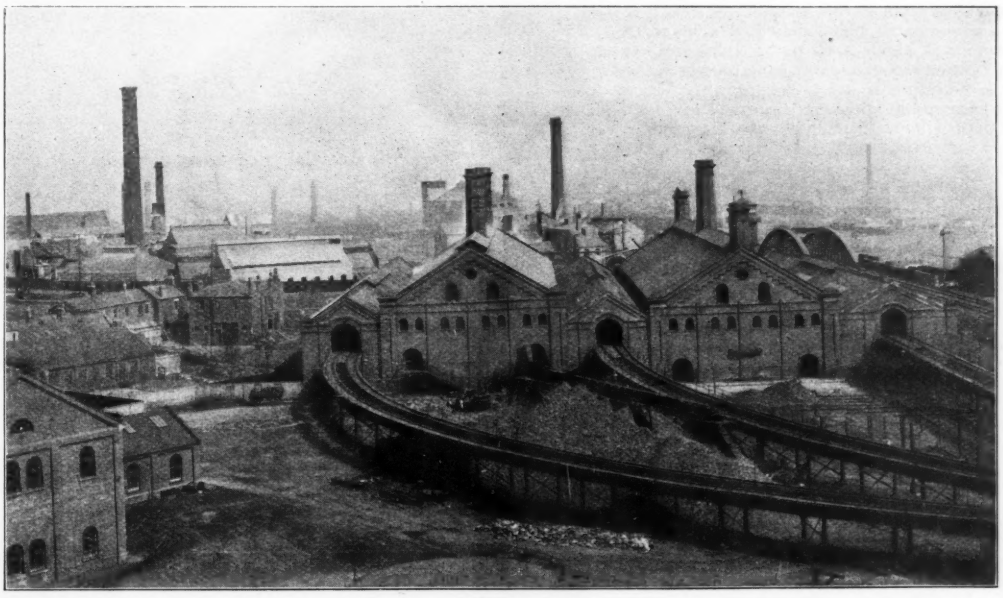
HAVING described the brickwork and carbonizing plant at the Sculcoates Gas-Works, we proceed now to deal with the

COAL AND COKE HANDLING PLANT.

Throughout the scheme, the dominant feature is the discarding of all elaborate mechanical appliances; only what is actually necessary being employed, but with an adherence to the principle of thoroughness in arrangement and detail, commensurate with the highest efficiency. The overhead hoppers in the retort-house hold twenty-four hours' supply of coal, have over each bed three measuring-chambers, which have a maximum capacity of 8 cwt. per discharge, but can be regulated down to 5½ cwt. The levers are worked from the farther side of the charging-stage from the bench, and are fitted with Mr. Archibald Little's patent doors; all checking of flow being done with one lever, which controls the measuring-box.

The coal is distributed to the hoppers by 15-inch push-plate conveyors, working to right and left from the centre of the house. By adopting this plan, six or less beds could be worked with only one conveyor in action, which means a saving in power and wear and tear. The conveyors are fed by an elevator, which is fitted with breeches shoot and diverting door, to load the coal in the quantities required to each conveyor. The inlet to the elevator is in the coal-store. The pit is very shallow, as the storage hopper is above the ground-level, and can be fed by the coal-store conveyor, as described later on. The storage hopper will hold about 8 tons; and it is governed by Mr. Corbet Woodall's arrangement of shaking-shoot, worked by a variable throw crank to regulate the discharge of coal to the elevator buckets. The end of the shoot discharges into an open catch hopper; the object of the latter being to admit of feeding by barrow or cart, should there be no coal in the store and none arriving by boat.

The plant is worked by a 25-horse power Crossley gas-engine, which is situated in the coal-store, and covered by a suitable brick-built house. A belt-drive, over fast and loose pulleys actuates, at the attendant's will, a main shaft working in bearings carried by stools from the floor under the charging-stage. The purpose of this shaft is two-fold. First, it drives the coal plant by means of a chain belt to a countershaft, which rotates and gives motion to the jigger feeder under the receiving-hopper, and also, by mitre wheels, transfers power to a vertical shaft, which in turn, by means of bevel gearing, drives a horizontal shaft, working in bearings carried in brackets bolted to the retort-house wall. This serves as the main countershaft, from which the various drives are taken to the countershafts on the elevator and conveyors; the power being transmitted by link belts. The second duty delegated to the main shaft is to transmit power through an overhead shaft at the end of the house, on to a cross shaft fitted outside the building; the



General View of the Works—Nos. 3 and 4 Retort-Houses in the Foreground.

connection being by clutches, so that the main engine can, when it is working on the coal plant in the day time, drive the coke-conveyors, and at night, by unclutching, the outside shaft can be made independent of the main drive. When removing the coke to store at night time, the conveyors are driven by an 8-horse power Grice gas-engine, situated in a house at the end of the coal-store, by fast and loose pulleys on to the outside shaft.

Having endeavoured to inform readers as to the system employed for automatically handling the coal from store to retorts, we will now deal with the coke-conveyors. A gap is left in the drawing-stage immediately under the retort mouthpieces; and into this is built a water-tight trough, composed of a ⅜-inch bottom plate, fitted with wearing strips, and riveted to the two 6 in. by 3 in. angle-bars which form the sides of the trough. This is 173 ft. 5 in. long, and rests on the 12 in. by 6 in. main floor girders. It is slightly inclined at each end to contain the water. The conveyor is of Mr. Archibald Little's patent design, as used at Barry, Greenock, &c., and consists of ½-inch trays, 13¼ inches long, joggled at the ends to give 1 inch lap, and measuring 1 ft. 6 in. wide on the flat portion. There is, in addition, an extra width of 4 inches, formed by the angled sides of the tray, which are 3 inches deep, and have their tops above the edge of the trough, and in line with it. Plates are built on to the front of the bench under the mouthpieces, angled so that, as the coke slides out, it is directed into the trays; the end of the guide-plate being made to overlap the tray, and so keep the breeze and dirt from getting into the trough. The edge of the trough next to the stage is slightly covered with projections on the floor-plates, which thus do similar duty to the guide-plates. The trays are carried entirely by rollers, which are used both for the loaded and return strand, and are made to travel with the trays. The runners for the return rollers are supported by brackets attached to the underside of the floor girders.

The conveyor passes through the end wall of the house, and discharges down a flat-angle shoot, a distance of not more than 18 inches, into the storage conveyor, which is of the gravity-bucket design.

The end shaft of the hot-coke conveyor revolves six times per minute, and that of the gravity-bucket conveyor five-and-three-quarter times; so that the speed of the conveyors does not exceed 45 feet per minute. The double links of the single chain are placed on opposite sides of the buckets, and are connected by a 1 inch diameter spindle. They measure 1¾ in. by ⅜ in., with a 1-inch boss drilled for a 1 inch diameter spindle, which carries the buckets inside and the rollers outside.

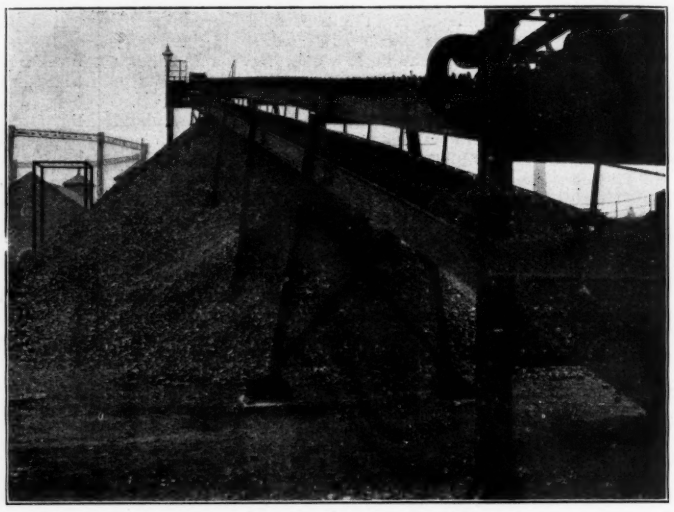
The loaded buckets pass back a distance of 3 ft. 6 in., and then are carried round the 4 feet diameter driving-wheels, so that the loaded strand passes directly over the coke yard, and the return strand overhead. At their lowest point, the buckets are only 3 ft. above the ground; and from here they rise at an angle of 11° to a height of 30 feet, measured at a point 135 ft. 6 in. from the driving-wheels. Coke can be tipped all along; and beginning at the low level, the trippers can be set, in their order, so that the fall of coke is not to the ground, but only to the top of the heap formed by the next lower tripper. Owing to local conditions, it is not necessary to put the coke into the storage hoppers for quick loading, or to arrange the return strand of the conveyor in a trench to reload from stock to trucks.

The conveyor standards are built of 6 in. by 3 in. channel bars, braced with 1⅜ in. by ⅜ in. lattice bars, and secured by 1 inch bolts to the concrete bases.

Transport of Coal from River to Store.

From this description, it will be judged how the materials for carbonizing are automatically handled from coal-store to coke-heap; and succinctly we may here set out the method employed for handling the coal from river to store, as well as the advantage that has been taken of the conveyor in making it work in conjunction with the retort-house plant.

A part view of the coal-store is given on next page; the wall on the right dividing the store and the retort-house, and that in the distance being the end wall at the roadway. On the other side of this is the Company's gantry. Here are fixed hydraulic cranes, the coal-buckets of which are made to discharge into a hopper, after being weighed; and this feeds a four-roll crusher, which admits of nothing larger than 3 inches passing through. Delivery is thence made to another gravity bucket conveyor, which passes round two sets of corner wheels—one set on the low level, and the other at a height which allows the buckets to pass into the house at the openings seen in the end wall, afterwards crossing the roadway in a box-girder. The opening mentioned has its underside level with the roof principals; and rails are carried from these on which the filling portion of the conveyor travels. By dumping or tripping cams, the buckets are revolved on their axle pins; and the contents are discharged over any part of the store, or, alternatively, direct to the hopper over the elevator-pit. By the open catch hoppers under the feeding jigger of the elevator, the coal lying near to the elevator can be shovelled into the buckets; but when it is desired to take coal out of stock from any part of the store, this is done automatically by the return strand of the gravity-bucket conveyor in this manner: A trench or culvert has a side wall built alongside a ledge of concrete, which is about 3 ft. 6 in. wide, and on which are mounted stools to carry rails, on which the rollers of the conveyor travel. Adjoining the ledge is a further excavation, allowing head-room of 6 feet, with a width of 3 feet. In this passage a man can conveniently walk from end to end of the store. Over the culvert is placed a row of chequred plates, and, at a convenient pitch in them, openings are formed terminating in shoots, closed by sliding-doors worked by gearing and hand-wheel in the culvert, under which Mr. Young has fitted some feeders of his own design. By opening any door, the coal from the store can be directed to the conveyor buckets; and this arrangement provides a ready means of thoroughly mixing different qualities of coal should this be desired. Some of the dusty coal got in by gas-works is excellent for gas-making, but swells and cakes considerably in inclined retorts, and is very friable, while nuts and "run of mine" ofttimes make breeze in excessive quantity, and are not high in the illuminating qualities of the gas produced. By mixing, excellent results can be obtained, and, what is important sometimes, the combining in the measuring chamber of dust with nuts, beans, peas, or lumps, enables even new and unskilled workmen to be employed without affecting the evenness of the charge.



The Archibald Little Coke-Conveyor.

The coal from store is carried by the buckets in a continuation of the trench passing under the roadway, but which is reduced here as the extra depth for a man to pass along is not required. Once across the roadway, the buckets start again on the route already mentioned, passing through the opening in the end wall to the tripper above the receiving-hopper which works in connection with the retort-house elevator. The conveyor measures 500 feet long, and is driven by a separate gas-engine of 9-horse power, situated in a house under the gantry on the river wharf. The contract for the conveyors was also carried out by the New Conveyor Company, Limited.

The coal-stores have a capacity, which can be automatically dealt with, of 2610 tons of coal, and are of rather peculiar shape—measuring 170 ft. 3 in. long, 57 ft. wide at one end, and 21 ft. at the other. The roof is a single span, with every principal of different width and height, to suit the widening store. It was built by Messrs. R. & J. Dempster, Limited. Considering the peculiar shape of the ground, the cost of the stores is low, working out at 1·59d. per cubic foot, which includes every portion of the work.

This completes the first reconstruction of the carbonizing plant and stores. Plans have been prepared for doubling the retort-house; but a slightly different design of stores will be put down, on account of the oblong shape of the larger piece of ground available. The new one will measure 60 ft. wide by 136 ft. long; and on the end, there is additional space for general stores and meter shops. But even with the shorter length, a storage capacity of 3000 tons will be obtained.

Some General Particulars Concerning the Works.

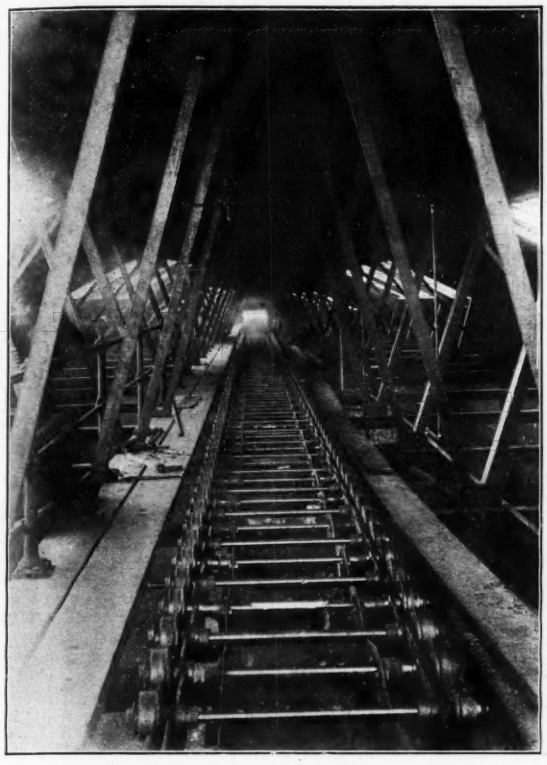
We mentioned in the early part of this article the improved settings and Arrol-Foulis machinery introduced into No. 4 house; and the first photograph this week shows the design of that and other of the buildings. The illustration also exhibits the coal-stores and excellent railway gantrys running into them alongside the retort-houses. All the settings when inspected appeared in excellent condition.

The gas from No. 1 retort-house passes through two condensers, one of which is of the battery type, and was placed in its present position over thirty years ago. It has a capacity of about 1 million cubic feet per day. The second condenser is of the annular type, and is equal to a duty of over 1 million cubic feet per day; so that all the gas made in the inclined retorts is dealt with by the two. Nos. 3 and 4 retort-houses (one being hand-charged and the other having Arrol-Foulis machines for operating its twenty beds) have separate condensers, consisting of two batteries of Clapham Bros.' water condensers, each capable of dealing with 2½ million cubic feet per day.

The next part inspected was the engine-house; and here a special note must be made of what is everywhere apparent in these works—the great care taken with the machinery, buildings, &c. The house is of neat design, built in brickwork, neatly tiled and tastefully decorated; and there is a complete absence of noise from the machinery. The roof is noticeable, being built of wood without any cross ties or king post, and supported entirely on the wall plates.

Conveyor from the Coal-Storepassing over the Roadway to the Jetty, and returning Underneath to the Trench below the Stores.

The machinery is of very varied description. Two of the engines are horizontal, coupled to Gwynne exhausters. Each has a capacity of 120,000 cubic feet per hour. There is also a vertical engine, coupled to a Donkin exhauster, capable of passing 160,000 cubic feet per hour; and the next and last set installed is also by Messrs. Bryan Donkin and Clench, to pass 180,000 cubic feet per hour, with the vertical engine running at 50 revolutions per minute. There is an interesting old relic, in one corner of this building, in the shape of an ancient pattern vertical engine, which is used to drive the smiths' shop machinery. The age of it is not known; but it dates back about half-a-century, and, when



Coal-Store.—Top Strand of Conveyor coming through the Opening in the Wall adjoining the Jetty.

[Note the peculiar principals for widening and heightening the roof.]

seen, was in excellent order. It was working smoothly at about 100 revolutions per minute.

Before passing to the washers, we may as well describe the main portion of the power plant. In all, there are no less than 21 steam-driven rotary engines on the works; and if we include reciprocating engines and pumps actuated by steam pressure, the number approaches 50, while there are also six gas-engines.

The principal steam-engines used for the hydraulic plants are two in number, each located in a separate house. One adjoins the exhauster building, and contains plant for producing pressure to actuate the hydraulic cranes and lifts used on the river and for the overhead light railways. There are three cranes, placed conveniently for handling coal from the various coal-stores. The power plant includes large accumulators, twin steam cylinders, and high-pressure double-acting duplicate pumps, made by Messrs. Abbot and Co., of Gateshead. In the accumulator cylinder a pressure of 600 lbs. per square inch is exerted.

The second hydraulic power plant is built alongside the mechanics' shop, and works the Arrol-Foulis charging machinery. This engine is similar to the one just described. But the pressure most suitable for the machines is 400 lbs. per square inch; and this is worked up to.

The mechanical section cannot be left without a word of praise to those responsible for its efficiency. As we said before, every appliance seems to be in the best possible condition, whether of new or old design and manufacture; and yet, with only a small but well-equipped mechanics' shop and a staff of seven fitters, all renewals and repairs are done entirely by the Gas Company. This does not refer merely to repair work or the fitting of parts obtained from the original makers, as it was noticed that pattern-makers are employed, and rough castings are procured locally, which are entirely machined and assembled under the direction of the head mechanic.

With this digression, we pass to the scrubbers and washers. The washing is done by means of two "Standard" machines of the Kirkham, Hulett, and Chandler design. The tower scrubbers are of Mann and Walker's patent, three in number, and have a capacity of 3 million cubic feet per day, being 12 feet diameter by 60 feet high.

The purifier-houses are built in brickwork, with a double-span, wooden, slated roof, set parallel to each other with a revivifying-shed between. The older house is divided from the shed by cast-iron columns; while the addition has a mid-wall having egress to the oxide-stores. The length of the three buildings is 221 ft. 9 in., and the total width 138 ft.

The purifiers are twelve in number, divided into two sets of six set in line, and the gas is sent into the houses in two streams, with an arrangement of pipes and four-way valves, which allows of the boxes being worked in any order desired. Good lighting and safe and efficient ventilation, are obtained by windows and outlets in all the walls, and by roof lights in the revivifying-shed. The purifiers measure 30 feet square by 5 feet deep; and they are charged only with oxide. The material is all dealt with by hand; the purifiers being of the ground-floor design, by Messrs. C. & W. Walker, and supplied with overhead cranes for the covers.

The meter-house is built of brick, and has a peculiar wooden roof such as was described in connection with the engine-house. There are two meters; the respective capacities being 100,000 and 160,000 cubic feet per hour, and the design is that of Messrs. Parkinson and Cowan. They need no special description. There are three district governors of Cowan's water-loaded design—two 30-inch, and one 24-inch.

The maximum make of gas per day is 6 millions, and the capacities of the gasholders are as follows: No. 1, 266,000 cubic feet; No. 2, 469,000 cubic feet; No. 3, 433,000 cubic feet; No. 4, 493,000 cubic feet; No. 5, 2,015,000 cubic feet; No. 6, 3,553,000 cubic feet—giving a total capacity of 7,229,000 cubic feet. The last holder is a standing monument to the skill of the late Mr. Dougall. From the crown of this holder, some the photographs were taken, which we have the pleasure of reproducing.

Carburetted Water-Gas Plant.

This was installed by Messrs. Humphreys and Glasgow, and is quite up to the standard exhibited in all other parts of the works. The total space occupied by the plant is only 120 ft. by 61 ft. 9 in.; and the Company will be able on this space to make 4 million cubic feet of gas per day.

The generator-house measures 73 ft. by 48 ft., is 30 feet high to the wall plates, and contains, at present, duplicate sets capable of making 2 million cubic feet per day, with foundations for two more sets. In the same house, and connected with the other plant, is a duplicate set of washers and scrubbers; while adjoining there is a condenser and final scrubber to take the gas from two sets, with foundations already prepared for duplicating.

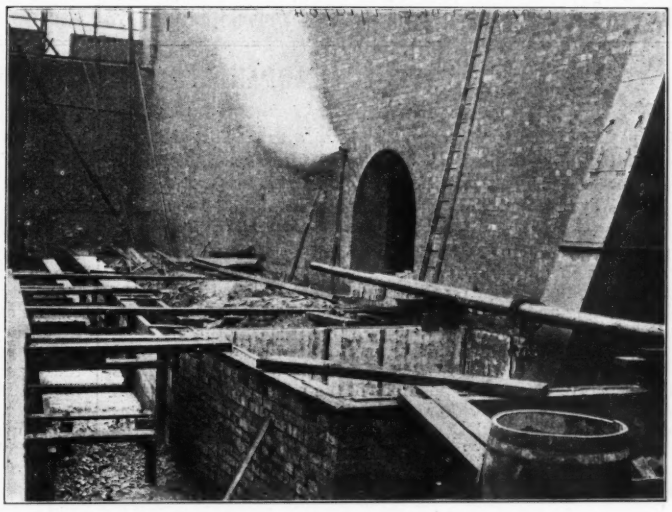
The coke is raised by hydraulic lifts, and either fed direct to the generator through bottom discharging trucks, or on to the ample storage platform. Designs have been prepared for overhead hoppers, mechanical transporting plant, and measuring chargers. In this and all other parts of the manufacturing plant, every regard has been shown to possible future needs.

There are duplicate Lancashire boilers attached to this plant, each measuring 24 ft. by 7 ft. 6 in.; and in an adjoining house are placed duplicate sets of Donkin's exhausters, with horizontal steam-engines, and two Westinghouse vertical steam-engines for driving two Sturtevant blowers. In both of these sections, the foundations have been laid for duplicate sets. The next portion of the building is devoted to the pumps; and above it is a water-tank of ample capacity. All the pumps are of the Worthington type, both for water and oil—each set being in duplicate.

The four purifiers for the carburetted water-gas plant are in a separate house, on the ground floor. Each box measures 30 ft. square by 5 feet deep.

Water-Softening Plant.

There being ten boilers on the works, the question of water supply is one of importance; and Mr. Young has installed a plant the main characteristics of which are as follows: The adjoining River Hull provides an inexhaustible supply of water; but as it is a tidal river, it is only at low water that freedom from salt can be obtained. It is, therefore, necessary that the pumping operation should not last longer than one hour; and pipes were laid

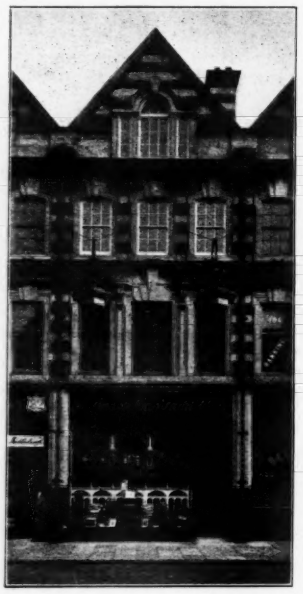


Coal-Store.—The Trench for the Conveyor, Opening in End Wall for the Top Strand of the Bucket Elevator for Serving the Bench Conveyors.

down through which a supply is drawn by a helical pump, at the maximum rate of 40,000 gallons per hour—the motive power being gas, which actuates a 10-horse power engine, driving the pump through countershafting by fast-and-loose pulleys. The water is chemically treated, and is forced into the settling-tanks, whence it flows by gravitation to all the boiler-feed cisterns. Each tank has a capacity of 40,000 gallons of water, which is fed in through 6-inch diameter overhead cast-iron pipes, having a valve over the top of each of the three vertical down pipes. Brickwork in cement was used for forming the containing and division walls; and each tank measures 24 ft. by 25 ft. by 11 ft. deep. There is a concrete foundation 2 feet thick, into which the walls are built 1 ft. 10 in. thick, and reduced for the upper 5 feet to 1 ft. 6 in. thick; the whole having a coating of cement to make them completely water-tight. After the sediment has had time to settle, water is taken out by a 5-inch pipe from one of the three tanks; a constant supply being always available. To ensure its being quite clear, the water is taken out at a height of 9 inches above the higher level of the concrete floor. This floor is made with a cross slope of 6 inches to the centre, and from here it slopes a further 12 inches to the back, where a sluice with gate and shoot is provided to each tank for removing the sludge. The water taken from the river shows an average of 23 parts of hardness per 100,000; and this is reduced to an average of 3·2 parts.

Sulphate of Ammonia Plant.

This is contained in a brick building, and has an output of over 1000 tons per annum; the product being of excellent character. The saturator is by Messrs. J. Taylor and Co., and is 5 ft. 6 in. square, and about 3 ft. 6 in. deep. It is constructed throughout of 2-inch plate-lead, and weighs 9 tons 15 cwt. The acid is brought right alongside the house in waggons on an overhead railway siding; and it gravitates to the several supply and storage vessels, which are made of wood and lead-lined. From here, it is raised by a Bailey injector. The foul gases from the saturator heat the incoming liquor, and are then condensed and scrubbed and passed through a Claus kiln, the effluent gases from which are purified by means of a tower containing limestone, and lastly by an oxide of iron purifier. There are two Lancashire boilers, and these (as well as 8 others) are fitted with Wilton's furnaces.



Exterior and Interior of the Show-Room in King Edward Street.

Tar Distillation.

There is a tar plant in use, consisting, mainly, of five 10-ton stills, each with independent condenser and separator. There is a very complete set of underground tanks of large capacity; and an anthracene plant, which has been put out of use owing to the very low prices which now obtain.

General.

The works throughout exhibit every sign of successful management, and reflect great credit on Mr. John Young, who is ably assisted by Mr. A. Allan, Mr. A. Dougall, and Mr. H. Chamberlain—all of whom are imbued with that desire for thoroughness which their chief has exhibited in all his undertakings. In no gas-works could the engineering problems be solved in better manner than they have been here.

Offices and Show-Room.

The Company have commodious offices in the city, and have recently opened a show-room for the sale of gas appliances. Of the show-room, photographs are reproduced. The street lighting of Hull is very effective, consisting of incandescent burners in clusters of five, three, and two. It will be remembered that a photograph of the lighting of one of the streets of Hull was given in the "Journal" for July 21, 1903. There are 153 miles of mains which supply 32,000 consumers; and the unaccounted-for gas is only 2 per cent. We heartily congratulate Mr. Young and his staff.

ELECTRIC LIGHTING MEMORANDA.

A Ratepaying Electricity Company Aggrieved over the Cost of Public Lighting by Municipal Electricity, and Offers to Supply at a Lower Price—Municipal Electric Lighting and Illogical Ideas—Two Ways of Reporting.

The London Gas Companies can extend a whole-hearted sympathy to the Electricity Companies operating in the Metropolis; for they are in the same boat as ratepayers, and are subject to the same prodigal policy on the part of the Borough Councils in public lighting and other matters. A singular situation has arisen south of the Thames in connection with street lighting by electricity; and it will be interesting to watch the result. Reference has been made to it before; but there have been developments which set forth clearly the positions of the parties. The London Electric Supply Corporation were the prime movers in the matter; and the Southwark and Bermondsey Borough Councils are the objects of their justifiable molestation—the Corporation being not inconsiderable ratepayers. Both Councils have shown up miserably in the affair. The Electric Corporation, as ratepayers and as purveyors of electricity, are incensed over the double way in which the competing municipal electricity undertaking is favoured to their detriment and at their expense—just as in the case of the Gas Companies. The municipal undertakings are under-rated in comparison with that of the Corporation; and the Corporation, human-like, have a natural and profound repugnance to having to contribute to the payment for public lighting at a higher price than they could themselves provide it at. Nothing better than the action of this Corporation could have been furnished to prove the superficiality of the case for municipal trading. In Southwark, the capital expenditure of the Electric Corporation is £39,160; and they pay in rates alone £265. In the parish of St. Mary, Newington, in which the Southwark Borough Council supply, the capital expenditure of the Electric Corporation is £7366; and they pay in rates in respect of the parish £55 14s. 10d. The capital expenditure of the Borough Council is £82,727; and the rates they pay only amount to £283! Taking either of the sets of figures given for the Electric Corporation, the absurdity of the amount of the contribution to the rates by the municipal undertaking is at once seen. The same in regard to Bermondsey, in which borough the capital expenditure on the Electric Corporation's undertaking is £39,949; and in 1905, in Bermondsey and Rotherhithe, they had to pay borough rates amounting to £341 7s. 3d. The capital expenditure on the Bermondsey Council's electricity undertaking the same year was £105,556; and it was only charged with rates to the extent of £414!

But of this preferential treatment of municipal electricity undertakings, Gas Companies are only too well aware. The

piquant part of the action of the London Electric Supply Corporation is in the offers they have submitted to furnish these two Borough Councils with current for public lighting at a cheaper rate than the Councils themselves are supplying it at. What the ratepayers think of this, it would be interesting to know, especially those ratepayers who are gas consumers, who have a distinct concern in the reduction of the cost of public lighting by electricity. In the case of Southwark, the amount charged against the rates for public lighting in the year ending March, 1905, is £3579. Deducting maintenance (£641), the sum paid in the year for electricity for street lighting was £2938, or 2·52d. per unit. The Electric Corporation have offered to supply the Borough Council with electricity at 1½d. per unit for street lighting, the difference between which and the 2·52d. would, on the present electricity account, represent a saving to the ratepayers of £1192. The Bermondsey public electric lighting costs £4747 13s. 8d. Deducting from this attendance, renewals, and repairs (£1244 os. 2d.), a sum of about £3503 remains as the charge against the rates for electricity supplied to the public lamps; being at the rate of approximately 3d. per unit. (We do not forget that Bermondsey gave birth to a clause much detested by municipalities.) The Electric Corporation's offer of 1½d. per unit in this case would represent an annual saving to the ratepayers of £1751 16s. 9d. The offers have no doubt placed the Councils in a quandary. The electric undertakings in both instances were shown, in the recent "Standard" articles, to be melancholy failures as commercial ventures; and therefore the undertakings cannot afford to lose the comfortable and assured income from the public lighting. The managements, it may safely be said, would like to have a little more of it. On the other hand, what are the Borough Councils to say to the ratepayers who have to pay for the public lighting? The ratepayers will naturally feel discontented when they know that, by patronizing the Councils' supply, they are paying in the one case £1192 and in the other £1751 more than they would do if buying their current from the Electric Corporation. The Councils are elected to manage the ratepayers' affairs with economy; and most of the councillors (unless they are different from candidates in other places) when appealing to the suffragists for their support at election times solemnly promise all sorts of things in the way of retrenchment. But the promises have a strange facility for falling through. Here is one way, put fairly and squarely before them, in which the councillors of Southwark and Bermondsey can partly redeem their promises, by transferring the public lighting custom from their own undertaking to that of the Electric Supply Corporation, or, if they want to go even better, by converting the lamps in the electrically lit streets to incandescent gas lighting. But they have rejected the offer of the Corporation; and the Corporation, as ratepayers with a big grievance, have sent the whole of the correspondence to the Local Government Board and the London County Council, with a statement of certain considerations. Municipal trading in electricity supply cannot, in face of this, be justified in Southwark and Bermondsey. It is not in this case a question between a Town Council and a Gas Company, but between Electricity Supplying Councils and an Electricity Company; and the incident throws a penetrating light on municipal trading and the methods by which it is fostered. We hope the matter will not end here; but that it will stimulate to action those who are in a position to make an impression on these spendthrift and speculating Councils.

There cannot have been any more fruitful source of illogical ideas than that of municipal electric lighting during recent years. A paragraph in last week's "JOURNAL" (p. 694) chronicled that at Colchester the question has been raised as to whether the Electricity Committee should have the control of the public lighting transferred to them ostensibly with the view of making things better for their own undertaking, or whether the present politic plan should be continued, of having an independent Committee to continue the administration of the public lighting. The Electricity Committee and their Engineer we suppose cannot see the reasonableness of anyone's preference for independence on the grounds that a Committee untrammelled by an electricity or gas undertaking can bargain for the best terms in the interests of the ratepayers, and, if the members are unprejudiced, can ensure that the ratepayers get what they contract for. This gives a double protection to the ratepayers. (Parenthetically it may be stated that at Tunbridge Wells there has been complaint of the cost of street electric lighting; and the Mayor has suggested that the public lighting ought to be in the hands of the Watch Committee, and not of a Committee who might conveniently forget that gas is the cheaper illuminant.) The Colchester Electric Lighting Committee are now proposing to contribute to the rates a little douceur in the shape of £500; and one of the councillors questions whether they have any right to "hand over this money to those who do not use the electric light in order that they may pay their gas bills." The gentleman who made this remark does not shine in this instance as an adept in fashioning his ideas. It is seen that public lighting contributed to the electricity accounts last year £908 11s. 8d.; so that the ratepayers who are gas consumers are "customers"—however unwilling—of the electricity undertaking. Fortunately, through having the public lighting in the hands of an independent Committee, the amount is not a heavy one; but it is over this that the point has been raised as to the advisability of having the public lighting in the hands of the Electricity Committee. If the lighting were so transferred, and the last-named Committee had their liberty in swelling the receipts of the undertaking through the public lighting at the expense of the ratepayers generally, it may be supposed that the gentleman who made the above remark would be willing to admit that a contribution from the undertaking to the rates would not be assisting the ratepayers to pay their gas bills, but would be assisting them to recoup some of the withdrawals from their pockets for the support of a wasteful system of street lighting. Where there is no electric lighting in the streets—no heavy bills being run up for the ratepayers through electric street lighting—and the municipal electricity undertaking has always been self-supporting, then we agree that the profits made, after making provision for the future, should be devoted to the cheapening of the product to those from whom the profits are made. It is remarked, however, that the Electricity Committee are still worrying over getting more public lighting; and they are offering to convert street gas-lamps for electric lighting at £3 8s. 6d. The Lighting Committee find that the actual amount charged has been £4 10s. 4d.; and they are inquiring as to the cause of the difference. Apparently, the offer refers to Nernst electric lamps, as complaints were made at the meeting that lamps of this type, in dangerous localities, had an unpleasant knack of going out when they ought to be doing duty. Gas-lamps do not have that bad habit, owing to their simplicity of construction and the reserve stocks of gas at the gas-works. Therefore we hope the Public Lighting Committee will not be persuaded, by friendship, into committing the ratepayers to further uncertainties of this kind.

There are two ways of reporting things; and illustrations of these alternative ways have appeared in two electrical contemporaries. The one commences the report in question by saying: "Owing to the very inferior lighting obtained at the Downs School [of the Metropolitan Asylums Board] by gas, it has been unanimously decided to instal the electric light, at a cost of £2700." As the illuminating power of the gas supplied at the Downs School is the same now as it has been for years past, and as the burners and mantles now manufactured have not deteriorated in their valuable illuminating effects, there must be some explanation. That explanation was fairly given and not suppressed (as in the other paper) by the "Electrician." From this source, we learn that the "defective lighting was due to corrosion in the gas-pipes, which had been in use many years." To replace the gas system would cost £500; but the Board have decided to spend instead £2700 on electric wiring, fittings, mains, switchboard, &c., and current is to be supplied at 2½d. per unit. The Committee who have the matter in hand are of opinion that £25 per annum will be saved in the lighting bill, and that "25 per cent." better light and purer air will be another result. How exact these things can be computed by laymen in these scientific days! It is interesting not to say humorous; but we should like particulars as to how that £25 per annum is going to be saved with electricity at 2½d. per unit. Then cleaning and painting will also cost less. The Committee cannot surely have had experience of proper incandescent lighting. They must be basing their comparisons on the light afforded by gas supplied through old, choked, and inadequate-sized pipes; otherwise it would be the simplest thing imaginable to show that incandescent gas lighting leads in illumination, and leaves, in comparison with electricity at 2½d. per unit, a good round sum for cleansing purposes, which must be very desirable in schools such as this. Incandescent gas-lights are not the old flat-flame burners. And even in private houses of members of the Board, a "spring clean," we hazard the opinion, is regarded as a necessity to healthfulness. If it is not—well then we are not astonished at their decision.

Information on the Cheap.

Two correspondents send particulars of an inquiry addressed to them—and doubtless to many others at the same time—by the Manager of a Midland Gas-Works, whose name need not be mentioned in view of the statement he makes that he was "instructed" by his Committee to circulate the inquiry. The request is merely to know "the difference (if any) in quality as regards nuts and coal from the same seam;" but in view of the fact that no limit is suggested as to what coals are to be included in the reply—if any is given—a fairly lengthy "report" would be needed to effectively deal with the subject.

The Gas Section of the Irish Exhibition of 1907.

In the "JOURNAL" for the 5th inst. (p. 644), it was mentioned that at a meeting in London of the Preliminary Committee of Contractors who are organizing the Gas Section of the Irish Exhibition next year, it was resolved to hold a general meeting of gas contractors on the 27th inst. We learn that a large number of circulars have been issued by the Chairman of the Committee (Mr. Francis T. Cotton), announcing this resolution; and we trust they may result in ensuring a large attendance. It is in the highest degree desirable that definite arrangements for ensuring an attractive display of gas appliances of all kinds should be made as soon as possible; and a good representative gathering, before the holiday season commences, will be the best means of attaining this object.

ELECTRICAL MOTIVE POWER IN GAS-WORKS.

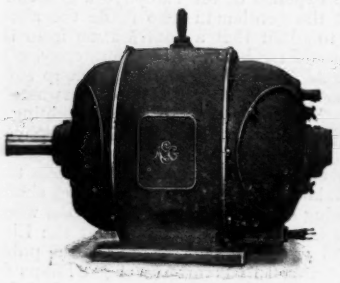


Fig. 1.—Three-Phase Motor, Completely Enclosed.

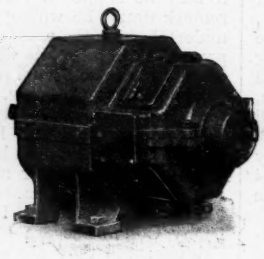
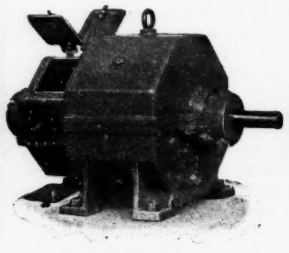


Fig. 2.



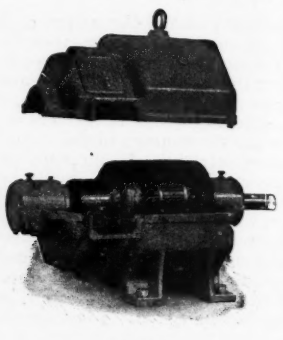


Fig. 3. Direct-Current Motors, Closed and Open.

Fig. 4.

No one who has followed the progress of the gas industry during the past thirty years will, we think, be prepared to deny that one of the most important features in connection with manufacturing operations has been the gradual supersession of manual labour by mechanical appliances. In the early days, the retorts were charged and drawn entirely by hand, and the barrow was the only vehicle employed for the removal of the quenched coke to the yard. As the result of the inventive capacity of Mr. West and others, all this has now been changed. The stoker's work has been lightened by the introduction of machinery, and the barrow has been largely replaced by the conveyor or tramway bogies. For operating retort-stoking machines, steam, compressed air, or hydraulic power has hitherto been employed. But another source of power is now available, in electricity, as managers who have adopted the De Brouwer machines have demonstrated; and thus what was at one time regarded with a certain amount of apprehension as a rival and a possible formidable competitor of gas, has become an auxiliary in its production. That its utility in gas-works need not be confined to the purpose just indicated, is evident when one considers for a moment the character of the force we are dealing with. In the first place, it has the advantage over steam of being applicable at a number of different points without necessitating the use of long lines of shafting and driving-belts; and, secondly, it can be utilized in an enclosed motor which can be fixed in places exposed to dust or the action of destructive fumes, such as those arising from sulphuric acid in the working up of ammoniacal liquor. Furthermore, the electric motor receives its supply of energy through a cable only; so that no attention is needed, such as is called for in the case of steam and hydraulic piping, and no loss of power in transmission, due to condensation, leaky joints, and so forth, is involved. Finally, the electric motor allows of considerable variation in speed—an important matter in the case, for example, of the De Brouwer charger. In view of the facility of adoption and other advantages possessed by these motors, we have deemed it of interest to our readers to enumerate some of the special features of those manufactured by the Electrical Company, Limited, of Charing Cross Road, specially for use in gas-works, which, we understand, have been found particularly well fitted for the work required of them. The motors sent out by the Company are furnished with cast-iron dust-proof and water-tight covers; and they are packed with hair-felt, which will stand for six months without renewal, and this is then easily effected by the removal of the screws holding the casing together.

Referring to the accompanying illustrations, fig. 1 shows the Company's standard of a three-phase motor completely enclosed; and special attention may be drawn to the protected position and good design of the terminal box, which gives an absolutely secure connection of the cable. This motor is also made with a ventilated casing, for use in a place which is free from dust and moisture, and where it is exposed only to mechanical damage. Figs. 2, 3, and 4 represent the Company's direct-current motors, closed and open, specially designed for use with the De Brouwer charger. The casing is in two parts, and consequently is easily dismounted. It possesses two inspection covers over the commutator, affording easy access for all purposes. The terminals and bearings are so protected as to absolutely exclude dust which is at times a feature in the vicinity of charging-machines. All the Company's motors are of such ample proportions that we are assured that no overheating has ever taken place, even during continuous night and day work.

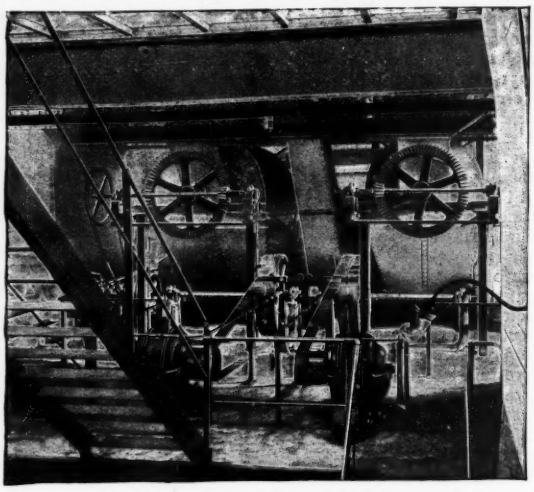


Fig. 5.—Coal Breakers and Screens at the Nuremberg Gas-Works.

The starters and resistance-boxes are all of the controller type, in which the contract-drum and resistances are contained in a dust-proof and air-tight cover. According to circumstances in

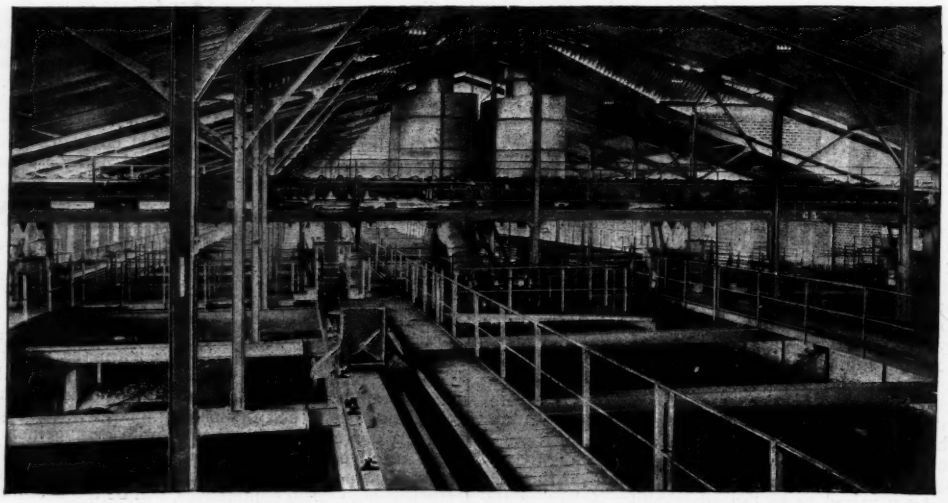


Fig. 6.—The Upper Part of the Coal-Store at the Nuremberg Gas-Works.

each case, these starters are made with or without oil-insulation. In the latter case, the starter for direct current is provided with a magnetic damper, which is not necessary with the oil-starter. The internal arrangement of the apparatus is such that for purposes of inspection it is only necessary to release the screws of the cover, to which the switch-drum and resistance are attached, to allow of the latter being withdrawn from the box, leaving the whole of the interior arrangement free. Any repairs can then be readily effected.

If the plan of the gas-works is such as to admit of the motors being installed in separate buildings of corrugated iron or wood having close-fitting doors and windows, it will not be necessary to use enclosed motors and apparatus, as the ordinary semi-enclosed types usual in the majority of works will suffice. As conductors, the Company use almost exclusively for outdoor work the ordinary underground cable and for the interior of buildings, what is called "ship" cable, covered with bronze wire, which resists both mechanical injury and chemical action. For sulphate-houses, it is protected from the fumes arising from the distilling operations by being coated with a special preparation.

The various operations connected with the manufacture of gas appear to present good scope for the employment of electric motors for the production of power; and evidence that their value is appreciated is afforded by the fact that the Company have during the past few years supplied them to upwards of forty different gas-works—among them being those at Amsterdam, Berlin, Breslau, Charlottenburg, Cologne, Ehrenfeld, Königsberg, Nuremberg, and Stettin. The total horse power of these motors is about 5000; and the dynamo capacity, 1000 kilowatts. Fig. 5 is a view of the coal-breakers and screens at the Nuremberg Gas-Works. These breakers are each capable of dealing with 40 tons of coal per hour; and each is driven by a three-phase 14-horse power motor with belting. Both are arranged to actuate either breaker singly, or to drive both breakers at once. This offers a twofold advantage. On the one hand, sudden shocks caused by overloads are taken up by both motors conjointly; while on the other, the mutual reserve power ensures great security against possible breakdowns. Two cylindrical screens driven by the same motors serve to take out the small coal, so that only the large lumps pass to the breakers. The Bradley elevators, which pass the coal to several conveyors, and distribute it in the store, are each driven by a 20-horse power three-phase motor direct-coupled to toothed gearing. These motors are all completely enclosed and dustproof. The capacity of this plant is also 40 tons per hour.

Fig. 6 is a view of the upper portion of the coal-store in the Nuremberg works. The coal is carried by eight belt conveyors, all actuated by the same mechanism. According to the number of these conveyors being served at one time by the elevators, one or two 10-horse power motors will be used to drive the gearing. Fig. 7 shows the delivery side of the retort-house. The De Brouwer troughs are fixed in front of the retorts to carry away the coke for slaking, &c. One 4-horse power motor works each of these troughs by means of chain-wheel gear. The Heckel cable tramway at these works is driven, through toothed gearing and belting, by a 10-horse power three-phase motor. Only one of the two cable pulleys is actually driven; the other being adjustable in order to facilitate the taking up of the slack. This tram-line carries the coke to the heaps.

Fig. 8 shows the coke-crane at the Berlin (VI.) Tegel Gas-Works, at one end of a suspension-bridge over which a cable tramway is laid for the crane to travel for the purpose of taking up and loading the coke from the heaps by means of grabs, opened and closed by a direct-current motor. The hoisting, lowering, and shifting of the traveller are effected by two motors; and the cable is worked by three 10-horse power motors. On the bridge, at any desired places, are arranged automatic tips actuated by the tram-waggons themselves. This bridge conveys the coke brought from the retorts by an electrically driven telpher line to the store or quenching-place, and is worked by two direct-current series motors, regulated by series-parallel controllers, which type is also provided for the regulation of the hoisting mechanism of the crane. In the coke-quenching house at the Tegel Gas-Works, two motors, each of 50-horse power, running at 580 revolutions per minute, drive all the elevators, conveyors, breakers, &c., and are started like all the others by a switch-drum starting-box; the current being supplied through a main-switch. The total capacity of this plant, with the three breakers, is 1200 hectolitres (3300 bushels) per hour.

On the ground floor of the coal-breaking house at the Tegel

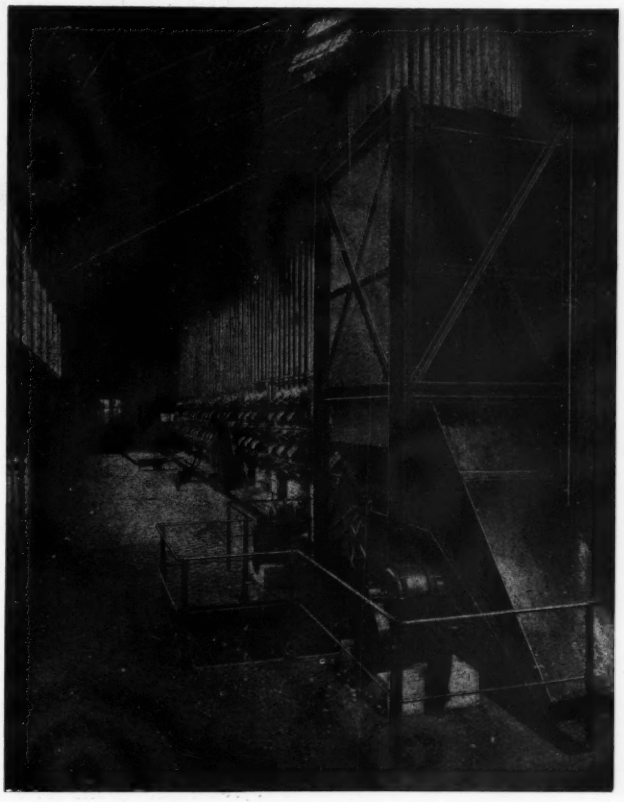


Fig. 7.—The Delivery Side of the Nuremberg Retort-House.

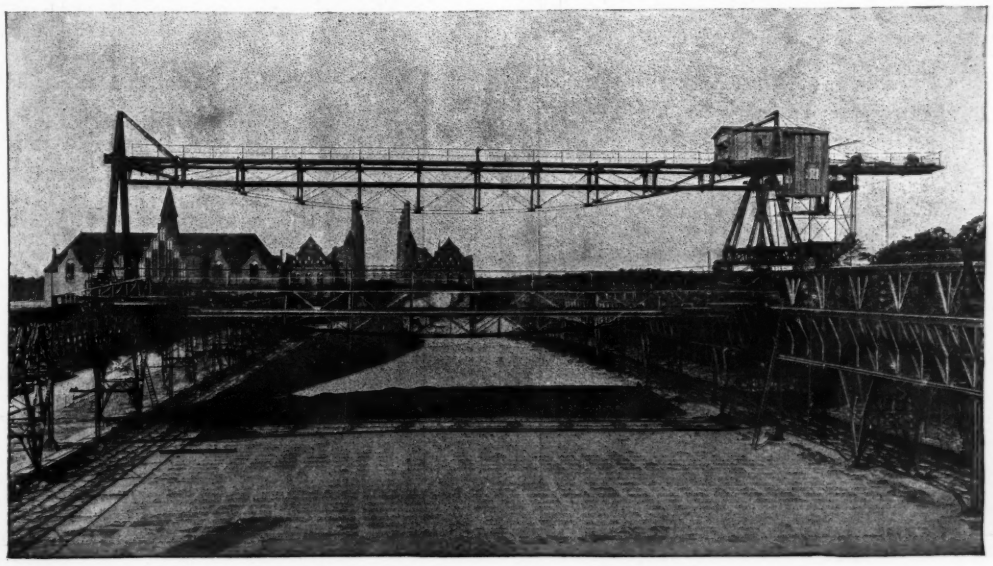


Fig. 8.—The Coke Crane at the Tegel Gas-Works, Berlin.

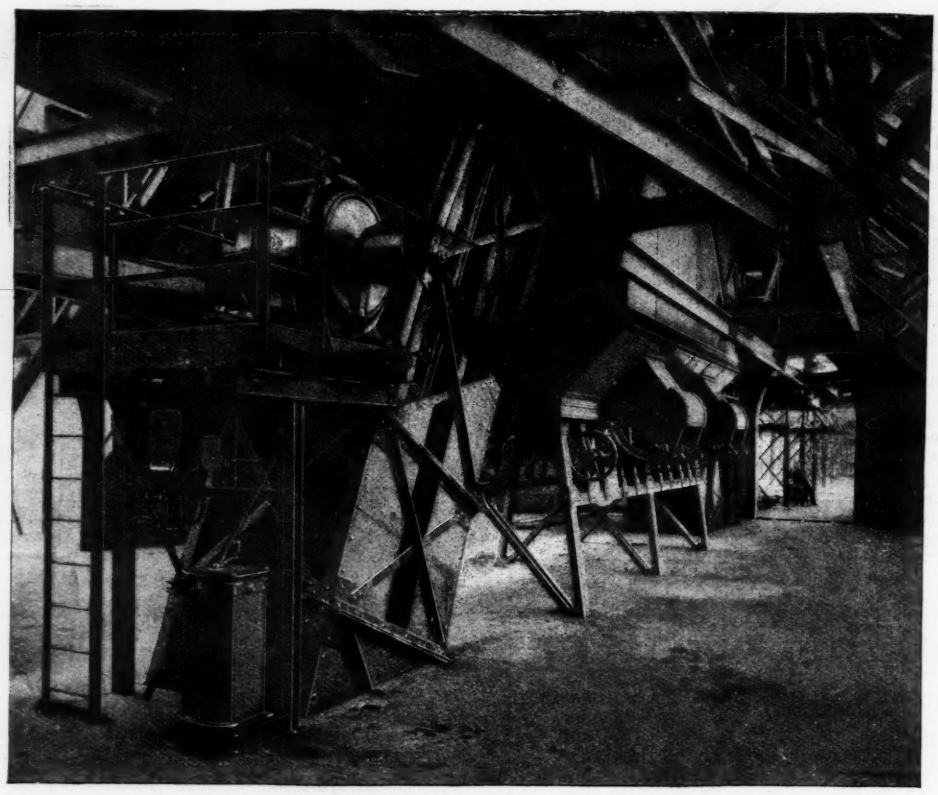
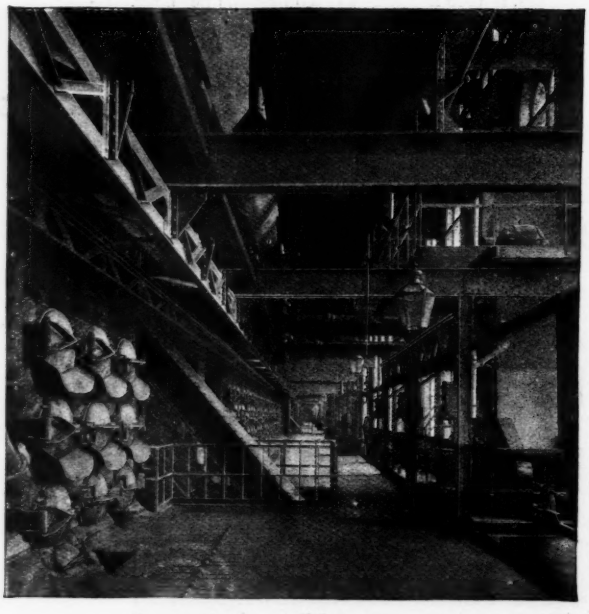


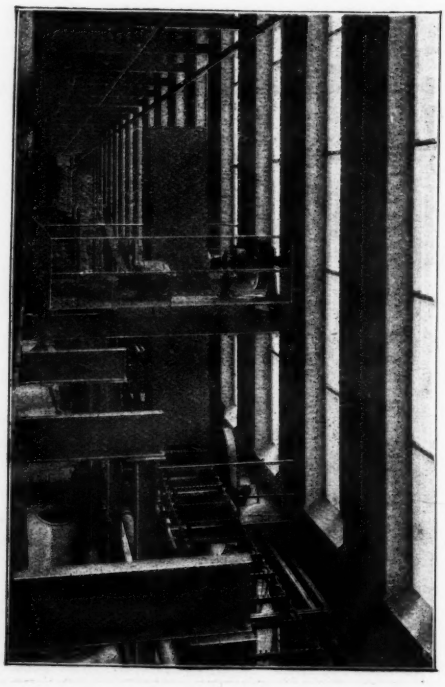
Fig. 9.—The Coal Breakers at the Tegel Gas-Works, Berlin.

works, four breakers of the Polysius type are erected, each pair driven by a 60-horse power motor. They are designed to serve as reserve to the other pair; and they deal with 60 tons of coal per hour. The starter and switch are as described above. One pole is protected by an automatic maximum cut-out; the other by a safety fuse. On the upper floor is the driving mechanism for the elevators (also duplicated) for the broken coal, which is raised to the hoppers, whence it is taken to the bunkers in the retort-houses over the suspension-bridge. A portion of this bridge is visible through the doorway in the end wall fig. 9. Each elevator will carry 150 tons of coal per hour, and is driven by a 30-horse power motor having a speed of 700 revolutions per minute. The rest of the equipment is of the usual kind.

Figs. 10 and 11 show the discharge side of the retort-houses at the Tegel works, two of which were completed by November last year. Each house contains five benches of eight settings of nine retorts of the Coze type, each 5 metres (16 ft. 6 in.) long, giving a total of 360 retorts. On the discharge level are the switch and starting apparatus. The motors for the conveyors are mounted on bridges above the floor; those for the elevators being fixed between each two benches. Five conveyors and four elevators suffice for conveying the coke from 72 retorts into the waggons of the overhead tramway. The conveyor and elevator plant in each house requires twelve motors, each of 5-horse power, running at 100 revolutions per minute.

The ordinary output of the crane plant at the municipal gas-works at Rixdorf, near Berlin, of which a description was given in the "Journal" for Aug. 9, 1904 (p. 387), is 35 tons of coal per hour. One 30-horse power three-phase motor drives the grab and the traveller. The coal is distributed from the grab either to the retort-house or to the stacks by the bridge (shown in fig. 12) by cable tramway, which is actuated by a 6-horse power three-phase motor; the bridge being worked by a 5-horse power motor. The coal is taken by hand from the stack to the breakers,





Figs. 10 and 11.—The Discharge Side of the Tegel Gas-Works, Berlin.

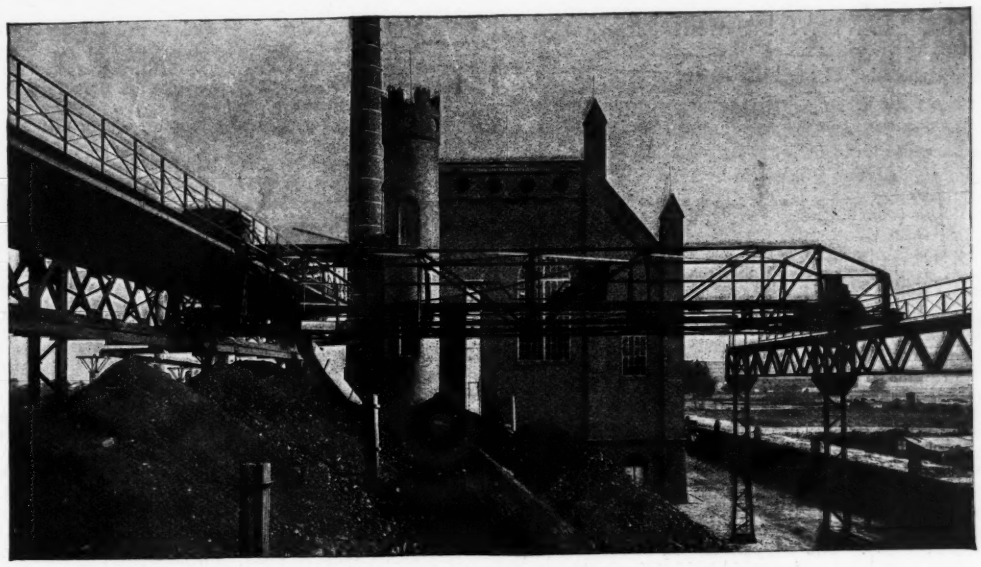


Fig. 12.—The Coal Distributor at the Rixdorf Gas-Works, near Berlin.

but thence to the bunkers, above and to one side of the Coze settings, by mechanical means.

At the Berlin municipal gas-works in Danzigerstrasse, thirty of the Company's motors are installed for purposes similar to those for which they are employed at the Tegel works, and including a waggon-tipping stage actuated by an 18-horse power direct-current motor. The switches and starters are of the controller type, with regulating mechanism and separate oil resistance, all enclosed in corrugated iron boxes to protect them from the inevitable large amount of dust. The motor is, as usual, completely enclosed. The stage is capable of dealing with eight 10-ton, four 20-ton, or even six 15-ton waggons per hour. There is on these works a crane which was originally operated by hand, and it could lift 2500 kilos. of coke; but it has been fitted by the Company with electric motors. The one used for lifting is a series motor, developing 11½-horse power when running at 400 revolutions per minute; that for moving the crane is a 1¾-horse power motor. This crane can now deliver about 18 tons of coal per hour into railway trucks, with two men to attend to the work. This shows an economy compared with manual labour of three men, and an increased output of about 10 tons of coal per hour, or double the work with half the staff. There are at these works two chain tramways for coal, in order to afford a reserve, each being driven by an enclosed shunt-motor capable of developing 10-horse power at 775 revolutions per minute. The load consists of three trucks, each of 1 cubic metre capacity on an incline of about 30°. There is also a (35·3 cubic feet) belt-conveyor for carrying coal to the new retort-house, a distance of about 500 feet. The belt runs over and draws a tip-waggon which can either be fixed or made to run forward or backward. The motor running at 1050 revolutions per minute will develop 13-horse power; the output of the conveyor being 50 tons per hour.

Fig. 13 shows a De Brouwer charger installed at the Gitschinerstrasse Gas-Works in Berlin, Each retort is charged in from 10 to 12 seconds. The motor in use for this machine is one of the Company's special design (shown in figs. 2 and 3), of 3-horse power. Only one man is required to work it. The retorts are 3 metres (9 ft. 10 in.) long; and each charge is about 180 kilos. (about 4⅓ cwt.) of coal.

The De Brouwer conveyor at the Duisburg Gas-Works, carrying coke from five retort-benches, is driven by a 3-horse power direct-current motor coupled direct to the toothed gearing; the whole being completely enclosed. For driving the coal-breaking plant there are two motors, each of which is of 12½-horse power. They are of the ventilated enclosed type, as they are fixed in a separate room, and are protected from damage. The average output of the plant is 60 tons per 24 hours.

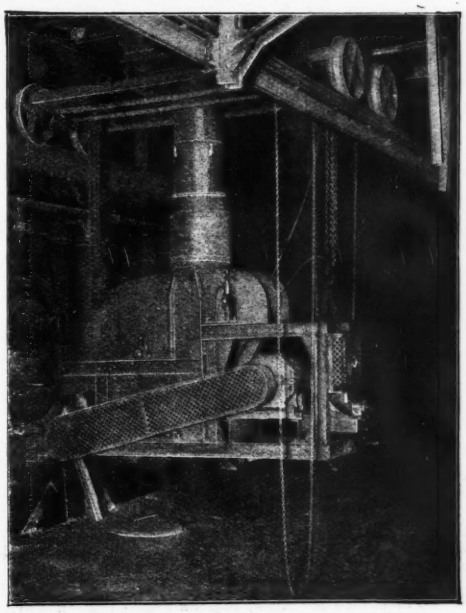


Fig. 13.—The De Brouwer Charger at the Gitschinerstrasse Gas-Works, Berlin.

The examples we have given of the use of electricity in gas-works indicate that it has established itself as a convenient and reliable source of motive power which is worthy of the attention of gas managers.

Belfast Gas Department Technical Guild.

The Belfast Gas Department Technical Guild, the formation of which was referred to in last week's "JOURNAL," is open to all officials and employees of the Gas Department. Its object is to secure facilities for increasing the technical knowledge of the members by providing a circulating technical library, arranging for gas technical classes, organizing meetings for the purpose of hearing and discussing papers on gas lighting and kindred topics, and co-operation generally on all matters calculated to secure the highest possible standard of efficiency in the discharge of official duties. A technical class is being formed for the ensuing session in the Municipal Technical Institute; and already more than forty students have intimated their intention to join. Visits to gas-works in other localities are in contemplation; and frequent meetings for the mutual interchange of ideas and experiences are to be arranged. The library (to which many gifts of books have been made) was opened some few days ago by Mr. A. M'I.Cleland, the Chief Inspector, who remarked that books on the subject of gas lighting were often expensive, and, with the great advances of science and craftsmanship, soon comparatively obsolete; but that library could be replete with up-to-date publications without undue strain upon the financial resources of individual members. He suggested that the members should visit other gas-works, observe the methods employed, and thus be in a better position to study the comparative merits or defects of various systems. Oral technical instruction and book knowledge should go hand in hand. He hoped the library would have long life, and become an ever-increasing source of pleasure and profit to the members.

The banquet to be held in connection with the Jubilee celebration of the founding of the coal tar colour industry by Dr. W. H. Perkin will take place at the Hôtel Métropole on the 26th prox. It is expected that distinguished chemists from all parts of the world will be present. The proposal, it will be remembered, is to present Dr. Perkin with his portrait, to place a marble bust of him in the rooms of the Chemical Society, and to establish a "Perkin Research Fund."

DE BROUWER PLANT AT DARWEN GAS-WORKS.

Starting of the Installation.

An event of more than passing interest in the corporate life of Darwen took place at the gas-works of the town last Wednesday, on the occasion of the official starting of the installation of De Brouwer plant which has been put in by Messrs. W. J. Jenkins and Co., Limited, of Retford. There was a numerous company, including the Mayor (Mr. T. P. Davies), the Chairman of the Gas Committee (Alderman Carus), the Gas Engineer and Manager (Mr. A. H. Smith), and the Contractor's representative (Mr. F. T. Gifford). There were also present the Chairman of the Gas Committee of the Bolton Corporation (Alderman Horrocks), and the Gas Engineers and Managers in that town and Blackburn (Messrs. W. Smith and S. R. Ogden).

The various features of the plant were fully explained by Mr. A. H. Smith. Commencing with the delivery of the raw material, he mentioned that the coal is conveyed in ordinary waggons, direct from the Railway Company's lines into the stores by means of an overhead railway carried on cross girders built into the walls about 15 feet above the floor level. It is then emptied in the usual way, through the bottom and side doors of the waggons, on to the floor over the coal-breaker pit. From the breaker the coal falls into the boot of the elevator, which delivers it on to a push-plate conveyor running above the coal-hoppers for the full length of the retort-bench. The hoppers are 14 in number (one to a bed of 7 retorts), and are each capable of holding 10½ tons of coal; making a total storage capacity, when all are full, of 147 tons, or 24 hours' supply. The plant is actuated by a 27 brake-horse-power "S" National gas-engine, which also drives the coke-conveyor. The measuring-chamber of the charging-machine is adjustable to hold from 6 to 8 cwt. of coal. The projector is driven by a variable-speed electric motor of 4-horse power, which serves to raise or lower it as required to suit the different heights of the retorts. The operations of charging and drawing these by means of the machines—the former occupying from 20 to 24 seconds and the latter about 30 seconds—were explained, as were also the details and action of the coke-conveyor. This is 2 ft. 6 in. wide and about 4 inches deep, and is fitted in the bottom with renewable cast-iron wearing-plates.

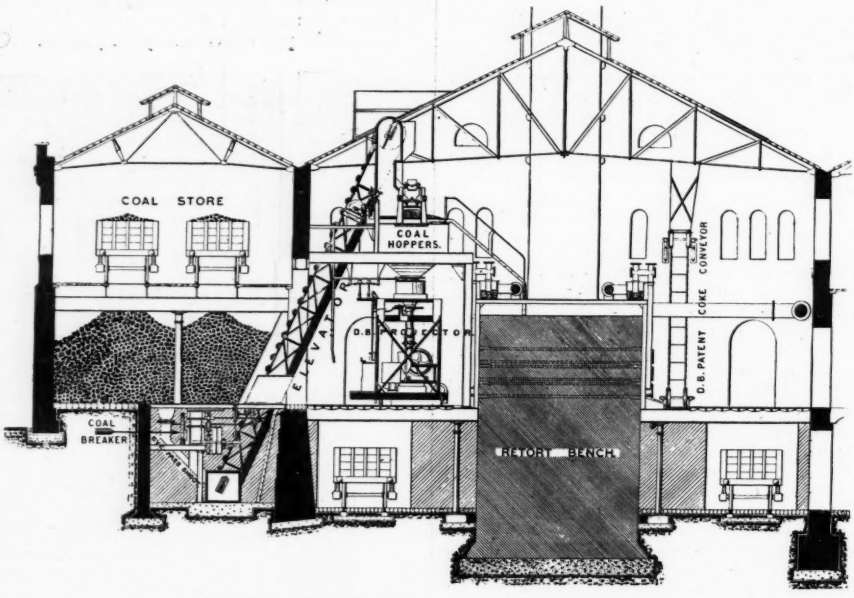
At the close of the inspection, the Mayor formally started the plant by charging and discharging a retort.

The Inaugural Ceremony.

The company then partook of refreshments, and a few toasts suitable to the occasion were honoured.

The Mayor, in proposing "Success to the New Apparatus," with which toast he coupled the name of the Chairman of the Gas Committee, said they had seen both the charging and the discharging machines at work; and it certainly appeared to him that the new installation would be a great saving, and a source of economy to the town. It was owing very largely to the foresight of the Chairman of the Gas Committee that the machinery had been installed. He took them to Derby to see it at work; and he (the Mayor) felt confident that the machinery made and supplied to them by Messrs. Jenkins was bound to prove a success.

Alderman Carus, in reply, said he was satisfied to-day, as he was when he first saw the De Brouwer system, that it would be as successful financially as it possibly could be, though, of course, they could not actually tell what the saving would be. There were no fewer than



Cross Section of the Coal-Store and Retort-House at Darwen.

forty of these machines installed; and he hoped that in Darwen the result of the working of the gas undertaking this year would be far different from what the Committee were able to report during the past twelve months. He conscientiously believed they had done a good thing in putting in the installation just started. He thought it would prove to be so for the town; and the men would not in future have to work like slaves.

Mr. A. H. Smith also responded. He said that in making his report in September, 1904, he estimated a saving of £694 by the use of the De Brouwer charging and discharging machines, after paying interest and sinking fund on the investment, and the cost of electrical energy, and allowing £115 for a coke-conveyor—making a total of £809. The present cost by the use of the machines was 10·45d. per ton of coal carbonized, against 24·38d. by hand stoking—a difference of 13·93d. The estimated cost of the installation was £5000. Allowing 13½ per cent. interest on this sum—say, £675—and dividing it by 20,000 tons (which was the estimated quantity of coal to be carbonized during the next year), came to 8d. per ton. When they had deducted this from the 13·93d., it showed a saving of nearly 6d. per ton. He felt satisfied that the installation would meet their most sanguine wishes, and save the amount he had estimated in his report.

Mr. Gifford said he was pleased, as representing Messrs. Jenkins, to see the successful working of the machinery they had supplied. When it was first installed there were certain drawbacks, principally owing to the number of orders the firm had to carry out. At the time they had 15 or 16 machines in hand; and altogether their orders to date amounted to 41 projectors and 21 discharging-machines in different parts of the country. He had to claim the indulgence of the Darwen Corporation in overlooking certain faults at the beginning; but now that the machinery was in operation, he was certain the figures given by Mr. Smith in regard to the saving would be more than realized.

Alderman Lightbown associated himself with the remarks made about the De Brouwer installation, as it seemed to him to be a desirable thing for the interests of the men. As a member of the Gas Committee for the last 24 years, he had had considerable experience of gas making; and he had always felt that the position of the gas stoker was one of exceeding difficulty, and one requiring the earnest sympathy of all.

Mr. W. Smith (Bolton) remarked that there was an improvement in the machine year after year; and when the Gas Manager at Darwen said it would save 6d. per ton of coal carbonized, he had underrated it. To his (Mr. Smith's) mind, it would come to 1s. per ton.

Captain Rawlinson, J.P., in proposing "The Health of the Mayor," referred to Widnes as a place where gas was supplied to the consumer at a very low rate, and drew the attention of their own Gas Manager to the fact that they ought to provide it as cheap in Darwen.

Mr. W. Smith replied to these remarks. He said that it had been stated that Widnes was supplying the cheapest gas in England. He was not, and never had been, an admirer of cheap and nasty gas. At Widnes they found that the illuminating power of the gas was 13 or 14 candles. At Bolton they were supplying gas of 19-candle power at a price per 1000 cubic feet which was relatively cheaper than that which Widnes was producing. He wished to correct the impression that Widnes was supplying cheap gas. The reason for the low price there was that the Corporation had practically no capital charges, interest, or redemption to meet; the figure in the borough being 1½d., against 1s. at Darwen. The Widnes Corporation were wise in their generation, for they had wiped off interest and redemption in past days. Widnes was not doing any better than Darwen. In conclusion, he said he did not believe in fleecing the gas consumer to make electricity cheaper.

Alderman Tomlinson remarked that what was good at Widnes they would strive to emulate, and what was bad they would put aside.

Other toasts were honoured before the company separated.

A FEAT IN WELL-BORING AT LINCOLN.

THERE are few towns which have not upon their municipal calendars certain days marked as being memorable in the history of the place—for example, the advent of the railway, the lighting of the streets by gas, or the provision of a proper supply of water, in supersession of the old stage coach or waggon, the oil-lamp, or the polluted well or filth-laden river. Such a day was Sunday, the 10th inst., for the venerable city of Lincoln; for on the morning of that day an important undertaking which had been in progress for about five years, and had been the cause of much anxiety to all who were engaged in it, was successfully accomplished. We allude to the deep boring for water which was commenced in the year 1901. The history of this unique work, some particulars in regard to which will be found in another part of the "JOURNAL," is interesting.

The city water supply is in the hands of the Corporation, who acquired it from a Company in 1871. With the progress of time and the growth of the population, more water has been required; and the difficulty has been to find a suitable source. In 1891, the Corporation consulted the late Mr. De Rance as to the possibility of providing a fresh supply; and he expressed the opinion that a boring carried down to the red sandstone in the neighbourhood of the city would produce a million gallons a day. He suggested, as an alternative scheme, the sinking of shafts and adits in the limestone, whereby, he said, "a variable quantity" of water, necessitating storage, could be obtained. Seven years later, the Corporation consulted Professor Hull, who formulated three schemes, and decided in favour of one—viz., the sinking of a well 200 feet deep, and the driving into the sandstone of a bore-hole of such size that it should not be less than 12 or 14 inches in diameter at a depth of 1200 feet from the bottom of the well. From this boring it was calculated that a million gallons of water a day would be obtained from a depth of 1900 feet. This supply was considered to be supplemental to the water drawn from the River Witham, on which the city stands. Professor Hull's report was made in October, 1898, and in the July of the following year Mr. Percy Griffith, of Westminster, was appointed as the Engineer for the Corporation in connection with the contemplated works, and he prepared the plans. In August, 1901, a contract was signed with Messrs. Chapman and Sons, of Salford, for £14,605, and the bore was commenced at the water-works. The main portion of the work was to be completed in four years. Unfortunately, serious delays occurred, owing to the loss of the boring-tool; but, as recorded elsewhere, all difficulties have now been overcome.

The Lincoln boring is the deepest in the United Kingdom. It was anticipated that the water-bearing sandstone would be met at a depth of 1400 feet; but the blue clays were 100 feet thicker than the estimate, and it was not until a depth of 1563 feet had been reached that the hidden store of water was tapped. The heavy boring-tool, weighing 2½ tons, had not penetrated the sandstone more than about 30 inches when the water rushed out with such force as to almost lift the tool; and in fifteen minutes it had risen to a height of 180 feet in a well 9 feet diameter. The water continued to rise at the rate of about 12 feet per hour in the upper portion of the well, which is of larger diameter by 3 feet than the lower part, and by Wednesday morning it overflowed at the surface. It had been calculated that the boring would furnish about half the city's supply, which varies from 1½ to 2¼ million gallons daily; but, judging from the present yield, it is confidently believed that more than twice the quantity required can be relied upon. It may be mentioned, as a matter of interest, that the Grenelle and Passy wells, from which a portion of the water supplied to Paris is obtained, are respectively 1797 and 1924 feet deep. The former took eight years and the latter five years to construct.

The work has been carried out under exceptionally trying circumstances; and upon its successful completion all concerned must be heartily congratulated. We can quite believe the statement of one of the members of the firm of contractors that the fight for water had been "dogged and determined." But though they were confronted at times with what seemed to be insuperable difficulties, they did not give up; and their perseverance has now been rewarded by results beyond expectation. This is the true British spirit, and whether it is displayed in well-boring or on the battle-field it is an admirable quality, and one which, so long as it exists, will keep this country at the head of the nations of the world. It has put Lincoln in possession of a supply of water which will, it may be hoped, render the inhabitants immune from such an epidemic as that which afflicted them in the closing months of 1904 and early last year. It has relieved the Corporation of much anxiety, and has fully compensated them for their patience in the face of misfortune. Finally, it has reflected great credit upon Mr. Percy Griffith, the Engineer. The piercing of the earth's crust to a depth of nearly 1600 feet—a depth which may be appreciated by imagining eight Monuments superposed—was an undertaking for which some men would have hesitated to accept the responsibility. But Mr. Griffith combines the skill of the engineer with the knowledge of the geologist; and this doubtless encouraged him, through all the difficulties he encountered in the progress of the work, to look with confidence to ultimate success. This he has now attained; and the memory of it will probably be more enduring than that of the troubles which attended its achievement.

SOME INCANDESCENT ACETYLENE BURNERS:

THEIR BEHAVIOUR AND ILLUMINATING POWER.

By F. H. LEEDS, F.I.C.

Soon after the more pressing difficulties in the generation of acetylene from calcium carbide were overcome, and the modern self-luminous burner based on the Dolan principle was manufactured satisfactorily, several inventors turned their attention to the construction of an incandescent burner for the gas.

Although the acetylene prepared in a well-designed plant is a most excellent illuminant when consumed in ordinary burners, and may be said to be almost without any successful rival in places where a supply of cheap coal gas cannot be obtained, members of the industry have naturally desired to render the light of acetylene still cheaper than it is at present; and therefore the various attempts made to construct a good incandescent burner have been watched with some interest. Of course, in the case of so intrinsically powerful an illuminant as acetylene, the advantages of burning it under a mantle are relatively less marked than in the case of coal gas; for taking common burners of ordinary domestic size and run at usual pressures, coal gas will emit (say) nine times as much light under a mantle as in an open flame, whereas the corresponding proportion with acetylene is more nearly as three to one. Again, the light given by acetylene in luminous burners is so brilliant and steady, and of such a pleasing tint, that it seems a pity in ordinary circumstances to forego the advantage of having no mantle to look after. Nevertheless, power to treble the light obtained from a unit volume of gas is not to be despised, unless an adoption of the incandescent system of combustion should introduce overwhelmingly serious defects or inconveniences.

A few of the incandescent burners constructed several years ago worked fairly well when tested by the present writer; but from information given him, it appeared that other samples behaved most indifferently. There were two or three causes for this. The burners, it was stated afterwards, were sent out by their makers without having been individually tested; and since the injector jets of burners passing only 10 to 15 litres per hour are very small, and have to be drilled most accurately, it is hardly surprising that the judgments passed on different specimens should vary. Secondly, there was a difficulty in obtaining suitable mantles for the burners—in this country, at all events. The mantles supplied by the burner makers lasted well enough (under proper conditions); but when they failed, only small Kern mantles could be procured here, and the latter were neither of the proper shape nor of sufficient strength to withstand the very high temperature of the acetylene flame. The third (and probably most important) reason why these earlier incandescent burners proved generally unsatisfactory, lay in the nature of the gas they had to consume. Even a few years ago the quality of the acetylene issuing from the average generating plant varied very considerably from time to time. When the generator was first charged, the gas contained much air; but the proportion fell to practically nothing before the carbide was entirely exhausted. The upper explosive limit of mixtures of acetylene and air is, however, so high that an incandescent burner will not bear an appreciable or variable quantity of air in the gas without exhibiting a tendency to fire-back with a sufficiently powerful shock to injure the mantle. The gas also usually contained its full complement of "carbide impurities," and was frequently heavily loaded with "generator-impurities." A normal amount of phosphorus in the former is fatal to a mantle in 100 hours or less; and the lime-dust of the latter chokes the burner jet or gauzes. It has also been stated that moisture in the acetylene is harmful; but no evidence of this has been obtained in the writer's experiments, where the gas was always naturally loaded, and presumably saturated with water vapour at the temperature at which it passed through the wet meter that was always used whether the burners were being tested on the photometer or not. A minor obstacle to the successful behaviour of these original incandescent burners depended on the irregular pressure thrown by many of the generating appliances sold; the displacement holders being frequently fitted without any trustworthy governing device to neutralize the effects of differences in the water-level.

Among the 92 German villages now provided with public acetylene supplies, nearly all the plants that have been erected within the past two years or so feed street-lamps fitted with incandescent burners, and a large proportion of the private lights in use are also stated to be incandescents. Most of the burners are said to be of a certain make, a specimen of which is in the writer's possession. This particular burner has worked well; but the mantles supplied with it have left something to be desired in illuminating duty, owing probably to an imperfect fit. Still, it is only right to say that reports coming from the German villages about the burner in question are mostly favourable. Another incandescent burner has been recently designed by Schimek, and is made by Güntner, of Vienna, in different sizes having nominal consumptions of 5 litres per hour and upwards. This is the type of burner that has been examined and tested most thoroughly.

The Schimek Burner.

The Schimek incandescent acetylene burner is constructed in three main portions. The lowest has an internal thread for

attachment to the bracket or pendant, two male threads on its upper part, and a female thread at the top, into which the jet itself is permanently screwed. Internally it is provided with a fine gauze of brass wire and a plug of cotton wool or the like to extract any dust from the gas. The middle main portion of the burner is the bunsen tube—parallel outside, but slightly tapered internally to a double truncated cone. The lower part is expanded into a mushroom head with a perforated base; and the central orifice in the latter screws upon the small upper male thread of the jet portion. The lower male thread of the jet portion supports a flat brass disc, which can be screwed upwards till it touches the base of the mushroom, or screwed down to leave an open space all round. The primary air enters between the upper surface of the disc and the bottom of the mushroom; and its volume is therefore under control in the same fashion as the air supply of the new standard coal-gas argand. The uppermost portion of the burner resembles the upper part of a "C" burner, but has a circular flame orifice, and an eccentric mantle rod. In putting the burner together, the bunsen tube and the jet portion are screwed up tightly; but the disc is left finger-loose. The lower edge of the mushroom or cone has half-a-dozen small notches cut in it; so that if the disc is run up to its highest position, some air still enters the mixing-tube. Indeed, the burner can be used temporarily without a mantle, by raising the disc as described. It then gives a round stumpy self-luminous flame, which does not smoke. When employed properly as an incandescent, the disc is lowered to its full extent. The mantles supplied with these burners are stated to be burnt-off and formed on a blowpipe fed with acetylene and air.

The nominal 10-litre burner in the writer's possession was erected with its own chimney upon a cheap, shaky coal-gas bracket in an exceptionally dusty room, and was fitted with a hemispherical cup and conical shade of opal glass taken from a gas argand. At pressures ranging (intentionally) between 3·8 and 4·3 inches, the burner was run for periods seldom exceeding two hours at a time from the beginning of last November to the middle of February, with one mantle only ("A 10"), when an accident happened in moving it. The light was about 3 feet above the level of the writer's desk, close to an inverted "Bijou" coal-gas burner; the two lights being employed (although that of the acetylene was the more powerful) indifferently for all purposes. The acetylene consumed was crude for a few hours, purified with "frankoline" most of the time, and "dissolved" for the remainder. At the time of the accident to the mantle, it had been noted to have been burning for 150 hours; but as it had been contantly lighted for a few minutes only to exhibit it, and to test its power of resisting ordinary treatment, the mantle had really been in use much longer.

The behaviour of both burner and mantle was entirely satisfactory, and the light was always excellent. Whether the burner cock was turned slowly or quickly, the flame lighted or went out smoothly; the small explosions observed with certain earlier specimen burners being absent. When the gas contained a little air, the burner lighted with a series of jumps; but they did no harm to the mantle. The occasional presence of air in the acetylene was due to the cock being on the wall end of the bracket; whereas for all small incandescent burners its proper position is as close to the jet as possible. On two or three occasions, the burner was alight for five or six hours during a bad black London fog; but it seemed to need less cleaning afterwards than the coal-gas incandescents elsewhere.

As an experiment, the burner had been lighted several times when the mantle was still in its proper position, with the regulating-disc screwed hard-up against the cone. This caused the flame to smoke freely, and to coat the mantle with soot. The formation of soot in such unfair conditions is inevitable, because the presence of the mantle round the flame interferes with the secondary supply of air which would otherwise reach it. As mentioned already, if it be desired to employ the incandescent burner for a short time as a self-luminous one, the mantle must be taken off. Nevertheless, in spite of the copious deposition of carbon upon the mantle, the soot burnt away in a few minutes when the air supply was increased again to its normal amount, and no signs of injury were ever apparent upon the mantle. At the time of its collapse, indeed, the mantle was in no worse condition than that of a coal-gas mantle of equal age.

Since these lines were written, it has been asserted that the failure of a mantle fitted upon an incandescent acetylene burner causes every object in the room to be covered with soot. The statement appears improbable on the face of it, because inside the mantle the flame is atmospheric or non-luminous, and when the mantle fails, the flame only receives an additional supply of air from round its base and edges. As a matter of fact, no such production of free carbon has ever been noticed by the writer—except, as already stated, when the adjustment of the burner was wilfully interfered with for experimental purposes. The chimney of his experimental burner is only 2 ft. 6 in. from the ceiling; but no mark or appreciable degradation of tint has appeared thereon. Indeed, it is nearly two years since the ceiling was "whitewashed," and there is no reason yet apparent for having this unpleasant domestic operation repeated. A second mantle has, of course, been alight on the same burner for many hours since that quoted as "A 10" succumbed to a hurried transference.

Through lack of opportunity, the precise emissivity of the "A 10" mantle was not tested when it was new; but after being alight for 32 hours at a pressure never exceeding 4·2 inches, it showed a duty of 98·2 horizontal candle power per cubic foot, and when it was known to be 150 hours old (really much older) its duty was 82·9-candle power. So far as could be judged from the other mantles which were employed for photometric purposes only, mantle "A 10" was a perfectly fair average specimen.

The Generating Plant.

The generator of the plant in which the acetylene consumed on the photometer was evolved, belongs to the carbide-to-water pattern. After bubbling through the lime-water of the decomposing vessel, the gas passes in fine streams through a washer, and then enters a small rising holder. From the holder, it passes through or past a purifier, having to force its way through 7 inches or less of material. When the material is "frankoline," the acetylene next passes through a layer of cotton wool; then through several inches of quicklime in small fragments; and finally through some inches of cotton wool again. From the purifier, the acetylene travels to a regulating cock with slotted plug, and then to the meter. At the meter outlet is a needle-valve, a pressure gauge, a large empty jacketed glass vessel (which acts as a pressure equalizer), and another stopcock with slotted plug. Here the gas-pipe branches—one limb leading to a bracket where the gas stored can be burnt off, and the other terminating in the cap-and-liner of a union. The meter employed passes 0·1 foot per revolution; the accuracy of its water level being periodically checked by graduations on the holder bell. The latter was graduated by pouring weighed quantities of water into it when inverted, a vertical height of about $\frac{1}{8}$th of an inch being equal to 0·01 foot. The liquid in both meter and holder is pure tap water; but it was charged with acetylene by being in use for some months before the photometric work was commenced. When tests are made with dissolved acetylene, the cylinder is connected to a separate inlet into the holder—the bye-pass on the purifier being opened; and in all cases the holder is filled with gas before making photometric readings, the generator or the cylinder being shut off. The precise working pressure is obtained by loading the bell (if necessary) when the burner is alight and all cocks are wide open, until the pressure thrown is about 0·2 inch above that desired. This is reduced to 0·1 inch above that required by moving the lever handle of the first slotted cock at the meter inlet, and finally set exactly with the needle-valve at the meter outlet. The numerous single figures for the burner consumptions obtained during the work showed that the pressure remained absolutely constant, whether the holder bell was nearly high or nearly low. When the generated acetylene burnt on the photometer was supposed to be purified, periodical tests with Keppeler papers were made to see that the material was still acting efficiently.

Photometric Observations.

Not much need be said about the method employed in measuring the light afforded by the incandescent acetylene burners under consideration. The standard light was a Harcourt pentane lamp. Only horizontal candle-power has yet been determined. Ten observations were made in each test—one every minute in the case of the large burners, and one every second minute when the burners were so small that the meter would not otherwise complete an entire revolution during the test. In the earlier portion of the work, five readings in each test were made by each of two observers; but afterwards each observer made his own complete set of ten readings. The figures recorded below are, therefore, the mean result of the two sets of ten readings each.

The Results Obtained.

The results obtained with the Schimek acetylene burners are given below. They are not as exhaustive as might be wished, owing to the limited supply of mantles in the writer's possession, and to the fact that the standard emissivity of the mantles is seriously increased by running them, even for a short time, at an abnormally high pressure. The probability of so great a change in this respect was not contemplated when the work was begun; and therefore some particular mantles were, for the sake of convenience, tested with dissolved acetylene at 4·5 and 5 inches of pressure before they were tried with ordinary acetylene at 4 inches. In consequence, their duties were raised by 20 or 25 per cent., as will appear immediately. In the following tables, the individual mantles are referred to as "A," "B," &c.; the figures "10" and "15" referring simply to the corresponding burner sizes. The numbers in the first columns are the consecutive numbers of the tests to which each single mantle was submitted. Except where otherwise stated, the mantles were only alight for an hour or so before the first test, and for ten or fifteen minutes between each subsequent one.

TABLE I.—*Nominal 10-Litre Burner.*

[Purified Acetylene. Mantle "B 10." Light measured through chimney.]

No. of Test.	Pressure. Inches.	Consumption. Cubic Foot per Hour.	Candle Power.	Duty.
1	4·0	0·470	42·3	90·0
2	4·0	0·478	46·0	96·2
3	4·0	0·474	45·2	95·4
4	4·0	0·470	45·8	97·4
5	4·0	0·467	47·0	100·5
6	4·5	0·498	52·8	105·0
7	4·5	0·499	53·8	107·8
8	5·0	0·528	60·0	113·7

It seems perfectly fair to reject the first of these tests at 4 inches pressure, on the ground that the mantle had not shrunk to its proper shape. Accordingly, the following are the average normal results:—

Pressure. Inches.	Consumption. Cubic Foot.	Consumption. Litres.	Candle Power.	Candles per Cubic Foot. Duty.
4·0	0·472	13·35	46·0	97·4
4·5	0·498	14·10	53·3	106·4
5·0	0·528	14·95	60·0	113·7

TABLE II.—*Nominal 15-Litre Burner.*

[Purified Acetylene, Mantle "C 15."]

No. of Test.	Pressure. Inches.	Consumption. Cubic Foot Per Hour.	Candle Power.	Duty.
1	4·0	0·660	67·5	102·3
2	4·0	0·662	71·3	107·7
3	4·0	0·664	70·6	106·3
4	4·0	0·665	70·4	105·8

This mantle was not tested at any pressure higher than 4 inches—being required for other purposes. The period through which it was alight before the completion of the first test was so long in comparison with the intervals between each succeeding examination that there seems no good reason for rejecting the first observations recorded, and therefore the mean normal results are as follows:—

Pressure. Inches.	Consumption. Cubic Foot.	Consumption. Litres.	Candle Power.	Candles per Cubic Foot. Duty.
4·0	0·663	18·8	70·0	105·5

Thus it is clear that a duty of 100-candle power per cubic foot can easily be obtained from even small incandescent acetylene burners when run at the lowest pressure for which they are intended by their makers. The precise duty appears to increase somewhat as the size of the burner increases, and more conspicuously as the working pressure is raised. This might, of course, be expected. Representative figures as to the manner in which the mantles decrease in emissivity with age cannot be given, because mantle "A 10," already described, was not tested when new. Assuming, however, it had the same original illuminating power at 4 inches as mantle "B 10," its original illuminating power after being run for a short time at a pressure up to 4·3 inches should have been somewhere about the mean between 97·4 and 106·4 (*cf.* Table I.), or 102-candle power per foot. On this basis, it may be said to have lost 3·6 per cent. of its emissivity in 32 hours, and 18·7 per cent. in 150 hours. But this assertion is made with all reserve, for manifest reasons.

The Effect of Pressure.

It has already been stated that the acetylene mantles examined not only exhibited a higher illuminative duty when run at an abnormally high pressure, but retained that high duty, at least for some period of time, when afterwards tested at a lower pressure. This is shown to be the case by the following results; but it must be carefully understood that the figures now to be given are not normal, unless the conditions specified should be reproduced in practice. Table III. records the photometric measurements obtained with mantle "B 10" when its burner was fed with dissolved acetylene at a pressure of 4 inches, but after the mantle had been tested with purified acetylene at 4·5 and 5 inches (as shown in Table I.).

TABLE III.—*Nominal 10-Litre Burner.*

[Dissolved acetylene. Mantle "B 10." Abnormal results.]

No. of Test.	Pressure. Inches.	Consumption. Cubic Foot per Hour.	Candle Power.	Duty.
9	4·0	0·474	53·1	112·0
10	4·0	0·467	54·0	115·5
11	4·0	0·462	54·7	118·5
12	4·0	0·465	53·5	115·2

Tables IV. and V. indicate the similarly high results obtained on testing one particular mantle, "B 15," belonging to the larger burner at different pressures with purified or dissolved acetylene; the tests being performed in the order represented by the numbers in the first vertical columns of each.

TABLE IV.—*Nominal 15-Litre Burner.*

[Purified acetylene. Mantle "B 15." Abnormal results.]

No. of Test.	Pressure. Inches.	Consumption. Cubic Foot per Hour.	Candle Power.	Duty.
5	4·0	0·664	82·1	123·5
6	4·0	0·664	79·8	120·0
10	4·0	0·662	80·9	122·0
11	4·0	0·667	80·3	120·5
7	4·5	0·725	84·3	116·5
9	4·5	0·706	85·9	121·7
8	5·0	0·746	94·9	127·0

TABLE V.—*Nominal 15-Litre Burner.*

[Dissolved acetylene. Mantle "B 15." Abnormal results.]

No. of Test.	Pressure. Inches.	Consumption. Cubic Foot per Hour.	Candle Power.	Duty.
1	4·0	0·663	65·5	98·8
2	4·0	0·662	67·4	102·0
13	4·0	0·656	82·6	126·0
14	4·0	0·654	75·8	116·0
12	4·0	0·660	77·9	118·0
3	4·5	0·698	73·2	105·0
4	4·5	0·772	85·8	111·0

It will be seen that the first two tests at 4 inches with purified acetylene followed two tests at 4·5 inches with dissolved acetylene; while the second two tests with purified acetylene at 4 inches followed four different tests at 4·5 inches, and one with purified acetylene at 5 inches. On the other hand, the first two tests with dissolved acetylene at 4 inches represent the true emissivity of the mantle at that particular pressure with that form of acetylene; but the three last were carried out upon a mantle which had consumed gas several times at 4·5 and 5 inches.

Both of the Schimek burners began to roar slightly when supplied with acetylene at a pressure of 5 inches; and, therefore, they were not examined at any higher pressure. Hence it is not possible to say with certainty how far the duty of the mantles is raised by submitting them to a pressure exceeding the normal. The figures recorded in Table I. show that the "B 10" mantle exhibited a duty of 113·7 candles per cubic foot at 5 inches; while the average duty indicated in Table III. for the same mantle afterwards fed with dissolved acetylene at 4 inches only is 115·3 candles. This is appreciably higher than the average normal duty at 4·5 inches, but approximately equal to the normal duty at 5 inches. On the contrary, the four values found for the duty of the "B 15" mantle which are recorded in Table IV., are sensibly identical, although the first two were obtained before the mantle had been exposed to a pressure exceeding 4·5 inches, and the last two after it had borne a pressure of 5 inches. Test No. 7 in Table IV., carried out at 4·5 inches, was also performed on the mantle before it had been tried at 5 inches, and test No. 9 afterwards. The duty shown by test No. 9 is higher than that of test No. 7, but lower than the test No. 8 at the higher pressure; while the duties shown by the subsequent tests of the same mantle at lower pressures (again with purified and dissolved acetylene) vary somewhat irregularly. Hence it can only be concluded that the duties shown by all the tests in Tables IV. and V., from No. 5 upwards, differ only by experimental errors, and should be sensibly identical; or, in other words, that mantle "B 15" shrank to its most advantageous shape at a pressure of 4·5 inches, and subsequently exhibited as high a duty at a pressure of 4 inches as it did at 4·5 or 5 inches.

Influence of Acetone Vapour.

The primary object of carrying out all the experiments just described was to study the behaviour of incandescent burners and mantles intended for use with acetylene; and when dissolved acetylene was consumed, the writer's aim was to save the trouble involved in generating and purifying gas, rather than to ascertain whether any appreciable difference may exist between the illuminative duties of generated and dissolved acetylene when consumed under a mantle. Hence it is rash to draw any conclusions on the latter subject. Still, a few observations may be made tentatively. The gas which issues from a cylinder of dissolved acetylene is acetylene carefully purified from all carbide-impurities and freed from moisture. It, therefore, differs from what has been conveniently called purified acetylene, by containing some vaporized acetone. In the writer's experiments, however, both the dissolved and the purified acetylene contained a certain proportion of water vapour, because both gases came into contact (very brief contact) with water in the holder and the meter of the plant. According to Bournonville, ordinary dissolved acetylene contains vaporized acetone to the extent of 1 lb. per 1000 cubic feet, or 16 grammes per 1000 litres. But, according to Kuchel, the proportion is 0·06 litre of liquid acetone, or roughly 48 grammes, per 1000 litres. The latter is perhaps the more accurate statement. Acetone is said to burn with a white, luminous flame that does not smoke; but if it is distilled by heat out of a cylinder from which the acetylene has been previously consumed, it yields a short, smoky flame (Kuchel). The heat of combustion of liquid acetone is 426·9 large calories (Berthelot and Delépine); and the latent heat of its vapour is approximately 8·14 large calories per gramme-molecule. Hence the heat of combustion of vaporized acetone should be 435 calories. In other words, 58 grammes of acetone vapour, which occupy a space of about 23·5 litres when measured under British standard conditions, evolve $\frac{435}{315{\cdot}7}$ times as much heat as the same volume of acetylene, which weighs 26 grammes. Determinations of the "illuminating power" and "flame temperature" of acetone are unknown to the writer; but, in their absence, it might perhaps be expected that dissolved acetylene should be at least as powerful an illuminant in an incandescent burner as ordinary acetylene, and rather less efficient than ordinary acetylene in a luminous burner.

TABLE VI.—*Self-Luminous Burners.*

No of Burner.	Gas.	Consumption. Cubic Foot per Hour.	Candle Power.	Duty.
P1	Ordinary	0·350	10·45	29·9
,,	,,	0·3615	10·26	28·4
,,	,,	0·356	10·00	28·1
,,	,,	0·355	9·00	24·7
,,	Dissolved	0·350	9·17	26·2
,,	,,	0·350	9·43	27·0
P2	Ordinary	0·439	13·58	31·0
,,	,,	0·427	11·22	26·3
,,	Dissolved	0·425	11·07	26·1

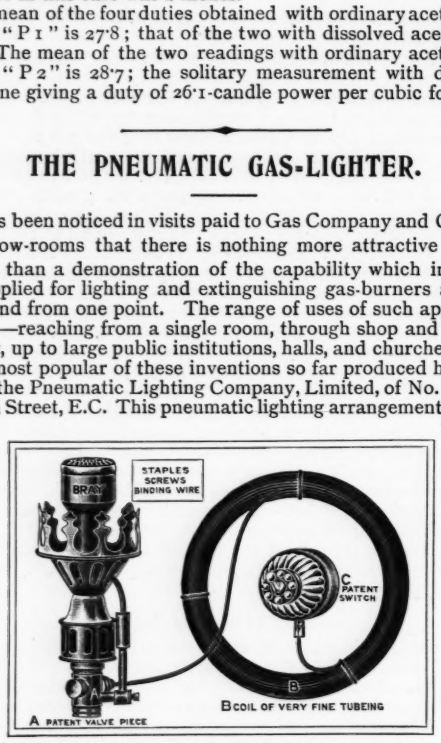
The writer has not yet been able to compare the duty developed by any one specimen mantle at the same pressure with the two forms of gas. The two first tests in Table V., carried out with mantle "B 15," however, show a mean duty of

100·4-candle power per foot of dissolved acetylene, and may be compared with the average results of Table II. (mantle "C 15"), which come out at 105·5-candle power per foot of purified acetylene. A few measurements were, indeed, made with ordinary and dissolved acetylene in a couple of self-luminous burners, of the "Naphey" type; but as the jets were old and small, the data given in Table VI. are submitted with reserve. The working pressure in this case was 2 inches.

The mean of the four duties obtained with ordinary acetylene in burner "P 1" is 27·8; that of the two with dissolved acetylene is 26·4. The mean of the two readings with ordinary acetylene in burner "P 2" is 28·7; the solitary measurement with dissolved acetylene giving a duty of 26·1-candle power per cubic foot.

THE PNEUMATIC GAS-LIGHTER.

It has been noticed in visits paid to Gas Company and Corporation show-rooms that there is nothing more attractive to consumers than a demonstration of the capability which invention has supplied for lighting and extinguishing gas-burners at a distance and from one point. The range of uses of such appliances is great—reaching from a single room, through shop and factory lighting, up to large public institutions, halls, and churches. One of the most popular of these inventions so far produced has been that of the Pneumatic Lighting Company, Limited, of No. 36, Farringdon Street, E.C. This pneumatic lighting arrangement was the



object of considerable interest at the Earl's Court Gas Exhibition towards the end of 1904; and the lighter as then presented was described in the "JOURNAL" for Nov. 22 of that year (p. 569). It was seen then that though the principle was right, the parts were capable of structural improvement. The old wooden push was not altogether an object of beauty, and (as will be seen by the illustration) it has been supplanted by brass fluted switches of very neat design. Copper tubing has taken the place of brass tubing. The valvular device for fixing at the bottom of the burner has also been improved; but as the action of the arrangement is so well understood by gas engineers, we need not go into details. It is now made in three sizes for "C" type burners and for lamps of 200 to 300 and 400 to 1000 candle power. There is one other departure which will be of interest—that is the introduction of gas-brackets with the flexible tubing running inside, and so, of course, out of sight. This is an advance which completes the neatness of the arrangement. There is one matter we should like to emphasize in connection with these devices, and that is that their popularity should not be allowed to become in any way impaired by slovenly or careless work. For there is no doubt, from the interest aroused in them at exhibitions and in show-rooms, that the gas consumer likes the idea of being able to switch his lights on and off at his own sweet will, after the manner of electricity.

At the Company's show-rooms in Farringdon Street, the apparatus can be seen fitted to brackets, chandeliers, billiard pendants, &c., and all controlled from one switchboard.

A new apparatus for the determination of the mechanical equivalent of heat was recently described by Herr H. Rubens in a German paper. A brass tube, 60 centimetres long and 4½ centimetres in diameter, closed at the ends by insulating caps through which project inwards the bulbs of two thermometers, is firmly fixed coaxially within a slightly larger highly polished and nickel-plated brass cylinder with closed ends, which can be turned in a vertical plane about a horizontal axis through its middle point. The inner tube contains a cylindrical mass of lead, weighing over 4 kilos., of but slightly less diameter, and of nearly half its volume; the remainder of the tube being filled with machine oil. Observation windows are provided so that the behaviour of the lead weight can be noted. The tube is quickly turned from one vertical position to another, halt is made for the short period needed for the weight to fall to the bottom of the tube, and the procedure is repeated; the rate of about ten turns a minute being possible. With this instrument the author has found J = 424·8 as a mean of ten observations with an average variation of 1 per cent. from the mean.

M. PARSY'S RETORT-SETTING.

M. Parsy, the Technical Editor of our contemporary "Le Gaz," has recently been granted a patent for a new setting of retorts, which, according to the published specification, contains several features of interest.

In retort-settings as at present constructed, the retorts to be heated, whatever may be the number, are grouped together, and the consequence is that the circulation of the combustion gases round them is more or less defective. The heat is badly distributed, and the result is variation in temperature in the different retorts. Those in the centre, which are usually heated from the sides by direct combustion, attain a much higher temperature

Fig. 1.

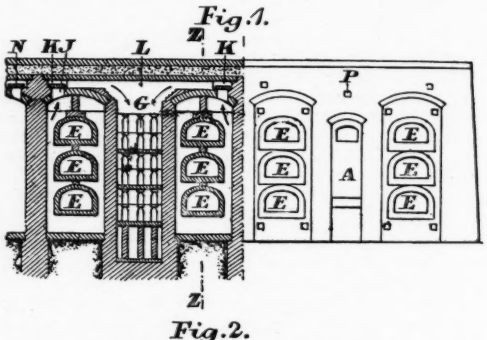


Fig. 2.

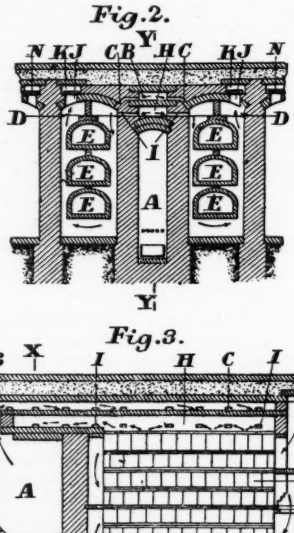


Fig. 3.

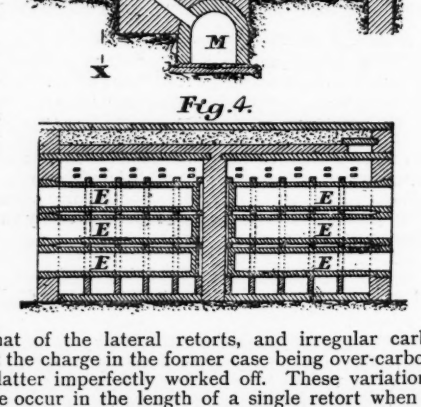
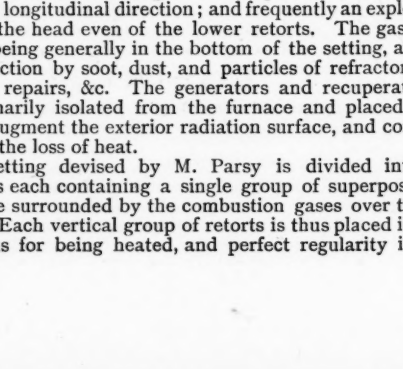


Fig. 4.



than that of the lateral retorts, and irregular carbonization ensues; the charge in the former case being over-carbonized and in the latter imperfectly worked off. These variations in temperature occur in the length of a single retort when the gases flow in a longitudinal direction; and frequently an explosion takes place at the head even of the lower retorts. The gas inlets and outlets, being generally in the bottom of the setting, are exposed to obstruction by soot, dust, and particles of refractory material used for repairs, &c. The generators and recuperators, which are ordinarily isolated from the furnace and placed under the retorts, augment the exterior radiation surface, and consequently increase the loss of heat.

The setting devised by M. Parsy is divided into heating chambers each containing a single group of superposed retorts, which are surrounded by the combustion gases over their entire length. Each vertical group of retorts is thus placed in the same conditions for being heated, and perfect regularity is ensured.

The generator and the regenerator are both on the same plane, and in the centre of the chamber; and by this arrangement the lateral cooling surface is avoided. The channels for distributing the gas and air and conveying away the chimney gases are all formed in the upper part of the setting, which places them out of the reach of obstructions, and renders them accessible for regulation, cleaning, &c. Heating is done by reversed flames.

The arrangement of the setting will be understood from the illustrations. Fig. 1 is an elevation, partly in section; fig. 2 is a vertical section on the line X of fig. 3; the latter figure is a longitudinal section of the furnace on the line Y of fig. 2; and fig. 4 is a longitudinal section on the line *Z* of fig. 1.

The combustible gas produced in the generator A is conveyed by the flue B, which extends the entire length of the furnace, to a series of burners C, by which it is distributed to the upper part of the setting. A damper P placed at the outlet of the generator allows of the regulation of the admission of the gas into the flue B. The secondary air, passing the damper F (fig. 3), enters the furnace at the base of the regenerator G, in which it rises, becoming heated as it ascends, and is distributed by the flue H and the burners I into the heating chamber D. The flames and combustion gases descend and entirely surround the retorts E, rising again at the other side of the chamber, in the direction shown by the arrows. They are drawn upwards by the openings J, and flow by the flues K and the collecting chamber L to the regenerator, which they traverse horizontally in a zigzag direction, and eventually pass into the chimney M. Dampers at N allow of the regulation of the outflow of the gases from each heating chamber; and the one at O controls the draught of the chimney.

In the setting illustrated, the retorts are of the usual length (9 feet), and are set back to back; but, the patentee points out, they may, of course, be replaced by through retorts, and the number may be greater or less than that shown. They may also be inclined.

COMPOSITION AND VALUATION OF GAS OILS.

The *agenda* for last Thursday's Meeting of the Society of Public Analysts (held at the Chemical Society's Rooms in Burlington House, Piccadilly) included a paper by Messrs. Raymond Ross, F.I.C., and J. P. Leather, on the "Composition and Valuation of Oils Used for Gas-Making Purposes." Owing, however, to other contributions being read and discussed before this, only a brief abstract of it was given by Mr. Ross.

In the course of his remarks, he referred to classical researches on the composition of petroleum from various sources, and then proceeded to give some account of investigations which the anthors had carried out in regard to Russian, Texan, and Borneo petroleum, and described some few compounds which they had isolated from them. Having in this manner ascertained the nature of some principal constituent hydrocarbons of several of the kinds of petroleum, they proceeded to carbonize samples of pure hydrocarbons representative of these classes, with the object of finding out to what extent the several hydrocarbons contributed to the gas-making value of the different oils. The hydrocarbons specially investigated were those containing eleven carbon atoms in the molecule. Undecane is the eleventh hydrocarbon of the paraffin series, and is representative of the principal constituent hydrocarbons of Pennsylvanian petroleum. The corresponding hydrocarbon of the olefine series is undecylene; and this may be taken as representative of the principal hydrocarbons occurring in Scotch gas oil. Decahydronaphthalene was taken as the hydrocarbon representative of the chief constituents of Texan gas oil. Another compound similarly investigated was tetrahydronaphthalene, which occurs in Borneo and to a less extent in other petroleums.

The results of gas-making trials with these hydrocarbons are shown in Table I.; and, with regard to them, it will be observed that the open-chain single-bonded hydrocarbons of the paraffin series, represented by undecane, give the highest gas-making value, while the double-bonded olefines, represented by undecylene, fall somewhat short of the paraffins. Coming to the close-chain compounds, it will be noticed that those containing the highest proportion of hydrogen give the best gas-making results, though they are not equal to the open-chain compounds.

TABLE I.—*Constants Obtained for Pure Hydrocarbons.*

Name.	B.P.C°	Sp. Gr. 15/15	N_D	Spec. Refrac. Power.	Valuation Figure.
Undecane	194	·746	1·4182	·560	18,400
Undecylene	193	·773	1·4332	·560	15,961
Decahydronaphthalene	172	·843	1·4507	·534	11,373
Tetrahydronaphthalene	205	·977	1·5712	·584	1,829
Hexahydrocymene	161	·783	1·4323	·552	..

In regard to Pennsylvanian gas oil, the constituents are chiefly paraffins; but olefine and paraffinoid bodies also occur. Caucasian oil, on the other hand, consists mainly of paraffinoid hydrocarbons or naphthenes. Texan oil consists of complex ring compounds fully hydrogenated; while Roumanian oil consists chiefly of unsaturated ring compounds. Having regard to the composition of the various oils as ascertained, it would be expected that Pennsylvanian oil would give the best results for gas-making; and this expectation has been confirmed by the practical tests which the authors have carried out, both on a small scale and in a carburetted water-gas plant. The average results of gasification in the laboratory of samples of the oil from different sources are given in Table II.

These gasification tests were made in a small retort, the temperature of which could be controlled with precision and accurately determined by means of an electrical pyrometer. The oils were cracked at different temperatures, with a view to ascertaining which temperature gave the highest value in gas. The quantity of oil gasified in each trial was about 15 c.c. The yield of gas therefrom was measured, and the percentage of hydrocarbons absorbable by fuming sulphuric acid was determined. The authors deduced from these data the figure which they claim represents the relative value of each oil for gas making. This figure is obtained by multiplying the yield of gas by the percentage of hydrocarbons in it.

TABLE II.—*Averages of Gasification Results.*

Name of Oil.	Temperature of Cracking. Deg. Fahr.	Cubic Centimetres of Gas N.T P. per Cubic Centimetre of Oil.	Hydrocarbons, per Cent.	Valuation Figure.
Pennsylvanian	1260	445·0	35·8	15,945
	1400	529·9	30·1	15,950
	1510	563·0	26·6	14,967
Kansas	1260	438·9	33·6	14,747
	1400	482·6	28·4	13,706
Russian	1260	465·7	34·2	15,927
	1510	556·0	22·8	12,677
Russian refined	1260	429·0	31·8	13,642
	1510	518·0	28·4	14,711
	1700	550·0	21·5	11,825
Texas	1130	325·0	30·1	9,759
	1260	388·3	29·8	11,457
	1400	461·8	25·3	11,697
	1450	547·7	18·6	10,354
	1510	508·8	21·1	10,741
Californian	1130	370·8	29·8	11,051
	1260	529·9	26·6	14,090
	1400	573·9	25·4	14,589
Roumanian	1130	301·3	40·3	12,313
	1260	388·8	33·3	12,870
	1400	459·7	28·6	13,147
	1450	557·0	20·2	11,574
Galician	1260	452·8	35·5	16,074
	1130	341·8	34·6	11,925
Grosny	1260	421·9	34·6	14,468
	1400	501·6	25·8	12,941
Borneo	1260	301·0	26·8	7,067
	1510	472·0	17·0	8,024
	1640	495·0	15·0	7,425
Scotch	1130	364·8	40·3	11,548
	1260	426·4	34·2	14,587
	1450	491·5	26·0	12,790

TABLE III.—*Distillation Test.*

[Column A.—Specific gravity at 15° C. Column B.—Specific refractive power.]

Name of Oil.	210° to 220° C.		220° to 240° C.		240° to 260° C.		260° to 280° C.		280° to 300° C		300° to 320° C.		320° to 340° C.		340° to 360° C.		360° to 380° C.		380° to 400° C.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
Pennsylvanian	..	..	..	..	·797	·558	·821	·556	·833	·556	·841	·556	·851	·555	·862	·555	·871	·555	·877	·556
Kansas	·804	·556	816	·555	·829	·555	·838	·555	·850	·555	·860	·556	·867	·555	·874	·557	·882	·558	..	..
Russian refined	·825	·551	·835	·551	·844	·552	·853	·552	..	..	..	..	..	..	..	..	..	..	..	..
Russian	..	..	..	..	·852	·549	·855	·551	·862	·551	·871	·550	·879	·549	·887	·551	·897	·549	..	..
Texas	844	·546	·858	·547	·873	·548	·884	·548	·895	·549	·906	·549	·915	·551	·923	·551	·928	·552	..	..
Californian	·822	·554	·836	·553	·851	·553	·864	·554	·880	·554	·895	·557	·908	·555	·920	·556	·930	·559	·939	·562
Roumanian	·829	·556	·847	·556	·861	·556	·873	·557	·882	·557	·883	·557	·890	·557	·894	·557	·901	·557	..	..
Galician	..	..	..	..	..	..	..	..	·856	·557	·865	558	·876	·559	·888	·559	·904	·560	916	·560
Grosny	..	..	..	..	·857	·550	·860	·552	·876	·553	·886	·552	·894	·554	·902	·553	·908	·555	·917	·553
Borneo	·861	·560	·879	·560	·900	·560	·920	·561	·936	·560	..	..	..	..	..	..	..	..	..	..
Scotch	..	..	..	..	..	..	·833	·560	·844	·560	·853	·560	·864	·561	·877	·561	·891	·562	·904	·563

In addition to determining the yield of gas from the oil directly, the authors also submitted each sample of oil to fractional distillation. They distilled about 250 c.c. of oil, and measured the quantity condensed at a temperature below 220° C., as well as the quantity for each 20° rise of temperature above this. Common to nearly all the classes of oil examined is the fraction distilling between 280° and 300° C.; and this fraction was more particularly studied by the authors with the view of comparing the chief gas-making hydrocarbons present in each oil. Generally they arrived at the conclusion that the oil improved in gas-making value with a decrease in the specific gravity and with an increase in the specific refractive power. A comparison of the figures in Table III. [p. 785]—more especially those that refer to the fraction distilling between 280° and 300° C.—with one another, bearing in mind what has been said as to the gas-making value of the oils, will show the relation indicated. Corresponding figures for the gas-making value of portions of five classes of oils, separated out by freezing, are given in Table IV.

TABLE IV.—*Results Obtained on Gasification of Frozen-Out Portions of Certain Oils.*

Name of Oil.	Cubic Centimetres of Gas per Cubic Centimetre of Oil.	Hydrocarbons.	Valuation Figure.
Roumanian	465·4	35·4	16,476
American	431·2	40·0	17,248
Texas	430·2	27·2	11,701
Borneo	342·7	26·4	9,047
Russian	425·3	38·9	16,543

The results obtained in their laboratory tests as to the gas-making value of the oils were, according to the authors, fully confirmed by trials in a carburetted water-gas plant, erected by the Economical Gas Apparatus Construction Company. The trials lasted in each case not less than eight hours, after the most suitable conditions had been ascertained by some preliminary working. The results of these trials will be made known later.

The discussion was opened by the President of the Society (Mr. E. J. Bevan), who complimented the authors on the large amount of valuable work which they had brought before the meeting. After a few questions had been asked by members,

Mr. W. J. A. Butterfield criticized the method of arriving at a valuation figure proposed by the authors, on the ground that the determination of hydrocarbons absorbable by fuming sulphuric acid was purely quantitative, and did not differentiate between the various classes of hydrocarbons which were so absorbed, and of which the illuminating and calorific value varied considerably. He also pointed out that, in making carburetted water gas, it was often advantageous to crack the oil so as to produce a large volume of aromatic hydrocarbons, such as occurred in commercial benzol, because the illuminating value of these hydrocarbons was considerably higher than that of the hydrocarbons which went to form an oil gas which was permanent by itself. He thought the working results obtained by the authors for Texan, Borneo, and Scotch gas oils were lower than they should be in comparison with those secured from Pennsylvanian and Caucasian oils. He also thought it was desirable to make a photometric, and possibly a calorific, test of the gas obtained in the laboratory trials—preferably after dilution with a known proportion of coal gas, so as to render the condition of testing comparable with the use to which the gas would be put when employed for the enrichment of coal gas.

Mr. Leather, replying for the authors, questioned the desirability of using benzene hydrocarbons as illuminants, because of the risk of their deposition in the tar.

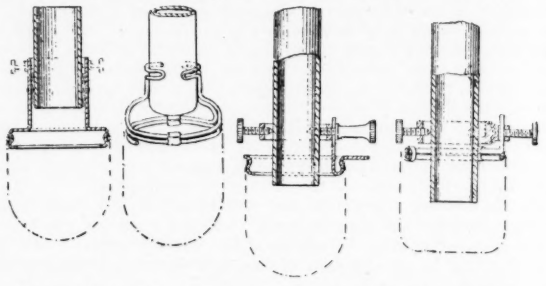
Those of our readers who perused the account we gave of the proceedings at the congress of the Société Technique at Havre last June, will doubtless remember that a conspicuous feature of the meeting was the hospitality displayed by the European Gas Company, Limited, by whom the town is supplied. Nothing was left undone that would in any way tend to the enjoyment of the members; and it was generally acknowledged that the gathering was one of the most pleasant the Society had ever had. This was primarily due to the liberality with which the social arrangements were carried out; but a very potent factor in connection with the visits to some important local works, which formed such interesting items in the programme, was the high esteem in which the Company's Engineer at Havre—M. Gaston Gautier, the *doyen* of their technical staff—was held in the town. That this feeling has in no sense changed was strikingly shown by the large attendance at the marriage of M. Gautier's daughter, Mlle. Gabrielle Gautier, with M. Louis Cherfils, which was celebrated in the church of Sainte-Marie on Monday of last week. Among those present to offer their felicitations to the bride and bridegroom at the close of the ceremony were Mr. R. Hesketh Jones, the Chairman, Mr. W. Williams, the Secretary and General Manager, and Mr. W. B. Brady, the Assistant-Secretary, of the European Gas Company, MM. Gustave Gautier, Coudelou, and Huon, the Company's Engineers at Rouen, Caen, and Boulogne (the two latter the brothers-in-law of the bride), and the principal representatives of the commercial, maritime, and manufacturing interests of Havre. To all the good wishes expressed on this happy occasion, we most cordially add our own.

REGISTER OF PATENTS.

Attaching Incandescence Mantles to Inverted Burners.—Salomon, S., and Norden, J., of Leadenhall Street, E.C. No. 10,157; May 15, 1905.

This invention relates to the adapting of incandescence mantles to inverted burners of various kinds and sizes and permitting the adjustment of the mantle to flames of various lengths.

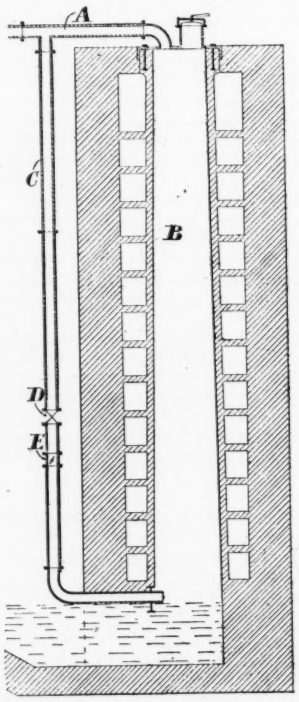
As shown, a ring or clip of fire-proof material is provided, to which the mantle itself is attached by a cord or wire and preferably provided with an extension or lugs furnished with set-screws or clips adapted to clamp the mantle ring on to a burner tube of any ordinary diameter and at any height above the tip of the burner. Or the mantle-ring and the clips or springs for attachment to the burner-tube may be made entirely of wire, with spring-clips to grip the burner-tube and two or three turns to form the ring proper to which the mantle is attached. In another construction, the ring or clip to which the mantle



is attached and the tubular or other extension which serves for connection to the burner-tube are made separate. In this case, the mantle ring or clip is provided on one side with a vertical fork or a lug adapted to be clamped at any desired height to another ring having also a number of set-screws or springs for clamping it to the burner-tube. Or the ring may be made of two or three helical turns of wire having also one part bent in a vertical direction, which is clamped in a hole in the adjustable ring surrounding the burner-tube. The upper turn of the mantle-ring may also be bent so as to form lugs whereby it may be held between the fingers.

Carbonization of Coal in Vertical or Inclined Retorts.—Woodall, H. W., and Duckham, A. M'D., of Bournemouth. No. 10,954; May 25, 1905.

The patentees, in their specification, point out that retorts for the continuous carbonization of coal are generally vertical or inclined to the horizon at an angle greater than the angle of repose of the coal. Such retorts are open at the bottom, where they are sealed from the escape of gas by dipping beneath a surface of water into which the hot



coke descends by gravity—evolving steam as it becomes quenched. This steam rises into the retort and, passing through the hot coke and coal, is decomposed, with production of water gas. In working with retorts of this kind, they have found that it is frequently desirable to adjust the quantity of steam which finds its way up the retort in this manner; and their present invention relates to a method of making such an adjustment and a device for the purpose.

This method consists in drawing the portion of the steam which is not to pass up the retort through an outlet near the lower end of the retort. According to the degree of suction applied at this outlet, either the whole or any desired fraction of the steam may be withdrawn before it passes up the retort. But, inasmuch as, in withdrawing the steam, it is difficult to avoid withdrawing some of the products of distillation from the lower part of the retort, they prefer to connect the outlet at this part with the escape pipe from the top of the retort at a point between the latter and the exhauster. Thus all that is withdrawn passes through the purifying apparatus; and none of the product is lost.

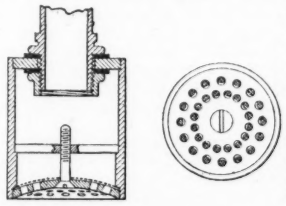
A device suitable for this purpose is shown—a vertical section through a retort. The escape pipe A from the retort B is branched at some point between the retort and the exhauster; and from the branch is conducted a pipe C, which enters the retort at a point near its lower end—preferably close to the surface of the water. This pipe has in it a cut-off valve D and an adjustable damper E. When both valve and damper are open, the upper and lower ends of the interior of the retort are substantially at the same pressure, in which case practically all the steam and a portion of the products of distillation pass away through the pipe C. Generally, however, the damper is adjusted so that only a certain fraction of the steam passes away through this pipe. Thus any desired quantity of steam, up to the maximum which the heat in the coke produces, may be allowed to pass up the retort. If the whole is to pass, the cut-off valve D is closed.

Apparatus for Use in Gas Analysis.—Hartung, C. A., of Berlin. No. 17,708; Sept. 1, 1905. Date claimed under International Convention, Sept. 2, 1904.

This is of the class of automatic registering gas analysis apparatus. The portions of gas for analysis are drawn from a continuous stream of gas traversing a branch-pipe communicating at both ends with the main stream. They are drawn off through a mercury seal by means of a hydraulic pump, each stroke of which seals off a known constant volume of gas. This volume is driven, by the continuance of the rise of water in the chamber in which it has been sealed up, through an absorbent contained in another chamber, to which is connected a registering device, by which the volume of unabsorbed gas is recorded by inference from the pressure due thereto. A burette is provided, by which the accuracy of the records may be checked from time to time. As soon as the whole of the gas has passed into the absorption chamber, a syphon comes into action; and the drawing off of the water thereby liberates the residual gas confined in the absorption chamber, and at the same time pulls a fresh portion of gas into the first measuring chamber, ready for analysis in the manner described. A hydraulic check-valve is employed to ensure that the portions of gas drawn off for analysis have always the same known volume.

High-Pressure Inverted Gas-Burner.—Fairweather, W. C.; a communication from R. O. Klatte, of Hamburg. No. 18,018; Sept. 6, 1905.

This invention relates to a burner for suspended or inverted high-pressure gas-lights, in which the burner-head is closed at its lower end by a concave plate, prepared of non-combustible material, and provided on its edge with perforations for the passage of the gas mixture; the perforations being inclined to the axial line of the burner and parallel to, or in the direction of, the radii of curvature of the plate.



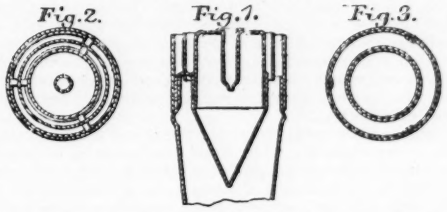
The burner-head depending from the burner-tube is closed at its lower end by a relatively thick, preferably concave, plate provided with perforations on the edge for the passage of the gas mixture. The plate (secured on the burner-head by a screw and engaging a cross-bar in the burner-head) is made of non-combustible material (such as steel, magnesia, or steatite), and not only gives a smooth supporting surface to the burner or mixing-sieve in front, but also protects the latter against burning. The passages, which are comparatively long owing to the thickness of the plate, are said to cause the gas mixture to burn first at the lower edge of the perforations "so that the flame is kept off the burner-sieve." The perforations are so arranged that their middle lines are inclined to the central line of the burner and thus meet beneath the burner. Owing to this arrangement of the perforations, the gas-air mixture is forced in downwardly and inwardly directed jets, which unite at a certain distance below the plate and join into one. The flame then "burns downwardly with a comparatively long flame-cone, in which the tendency in the usual suspended gas-lights to strike upwards round the edge of the burner-head—that is, the short-circuiting of the flame—is prevented.

Gas-Burners.—Harrison, C. W., of Middlesex Street, E.C., and Noad, A.C., of Pembroke Square, Kensington. No. 24,340; Nov. 24, 1905.

This invention has reference to incandescent burners when provided with conical gas-deflecting devices situated concentrically within the mouth of the burner so as to form a narrow annular orifice for the escape of the gaseous mixture.

This annular orifice at the mouth of the burner has, say the patentees, sometimes been made very narrow so as to avoid the use of the wire gauze or perforated plates generally employed for preventing lighting-back. The result is that an insufficient amount of the gaseous mixture passes through the restricted orifice to produce a flame sufficiently high to properly fill a large mantle under the ordinary pressure. Their object therefore is to so construct the burner that the gas-deflecting device will not unduly obstruct the flow of gas, and that the area of the annular orifice can be increased so as to avoid an unduly restricted outlet and yet enable the usual wire gauze or perforated plates for preventing "lighting back" to be dispensed with.

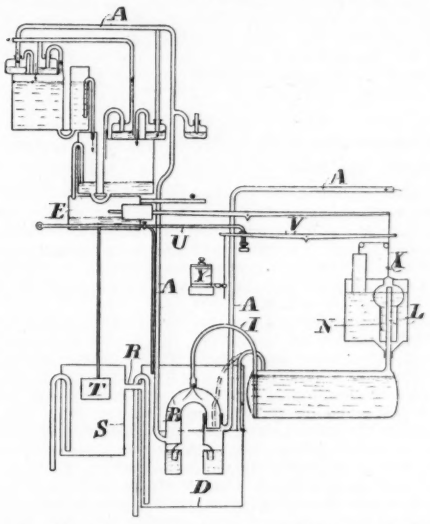
To do this, they, as shown, make the gas-deflecting device with a circular or cylindrical upper portion, which gradually diminishes in diameter downwardly without any abrupt alteration—such as a shoulder—in its shape, to a point where the gas-jet impinges upon it. An inverted cone, with a prolonged cylindrical upper portion of less diameter



than the mouth of the burner-tube, is said to be very appropriate for the purpose. The annular space existing between the circular or cylindrical portion of the gas-deflecting device and mouth of the burner-tube is made comparatively wide and preferably of considerable length, and is divided into two or more concentric annular orifices or passages by rings or tubes inserted into the comparatively wide annular space so as to form two or more concentric annular orifices or passages.

Apparatus for Use in Analyzing Gas.—Schatz, E., of Frankfort on Main. No. 25,466; Dec. 7, 1905. Date claimed under International Convention, Dec. 7, 1904.

This apparatus is of the class in which a portion of gas is measured off in a measuring chamber, passed through an absorbent, re-measured, and the proportion absorbed computed by difference. The apparatus is shown in its primary form; B is the measuring chamber, of tubular form; R the chamber containing the absorbent; and L a bell, with a scale N, in which the gas is re-measured after traversing the absorption chamber. A pump sucks the gas which is to be analyzed through the pipe A and the measuring chamber, in which a portion is sealed

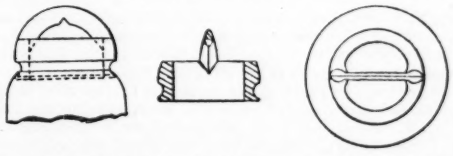


off by the rise of water, flowing from the cistern C, in the tank D. The volume sealed off is known. The continued rise of the water forces the gas so sealed off through the pipe I into the lower part of the absorption chamber, in which it rises through and over the surface of the absorbent to the bell, the rise of which indicates by means of the scale the volume of unabsorbed gas. The volume is registered on the cylinder Y, through the stop X on the bell-rod striking the lever V which carries a pencil. The lever V is released, through the lever U, when a float T, in a tank S serving as an overflow to D, is raised. The tanks S and D empty through the action of the syphon, and the cycle of operations recommences.

Two modifications of the absorption chamber—aiming at giving more intimate contact of the gas with the absorbent—are also described.

Mantles for Incandescent Burners.—Harry, G. A., of Clapton, N.E. No. 26,108; Dec. 15, 1905.

This is a device for use with mantles for incandescent gas-burners whereby the mantle "may be handled without risk of damage and its life increased." As shown, it consists of a ring of steatite or fire-clay



formed with an annular groove on its outer surface in which the upper end of the mantle is secured by an asbestos string or thread. The ring is provided with a cross bar, which rests in the forked end of the mantle-rod when the mantle is in position on the burner.

Recovery of Cyanogen Compounds from Crude Gases and from Products in the Manufacture of Cyanides.—Sims, W. E., and Bowes, H. No. 2929; Feb. 7, 1906.

In employing their invention during the manufacture of cyanides, the patentees propose to provide suitable stills into which the ferrocyanide solution and sulphuric acid are run. The ferrocyanide solution may include the ferrocyanide produced from any special recovery process, and may either be introduced direct or may undergo intermediate crystallization. The distilled hydrocyanic acid is absorbed by vessels containing caustic alkali; the saturated liquor being eventually run off into tanks, to be further treated as desired, while the absorption vessels are re-charged with alkali.

The insoluble compounds remaining in the still after the distillation of the charge are removed, freed from any excess of acid and soluble salts, and mixed with caustic alkali or alkaline carbonate, equivalent to the difference between the cyanogen in the ferrocyanide used for the distillation, and the cyanogen in the cyanide obtained, *plus* 5 per cent. excess, and *plus* a quantity of alkaline carbonate equivalent to five molecules of Na_2CO_3 for every six molecules of ferrocyanide taken for distillation.

The alkaline mixture, either alone or with ferrous hydrate or carbonate, is placed in a washer of any suitable kind for dealing with solids in suspension, and therein subjected to the action of sulphuretted gases containing cyanogen compounds.

As the insoluble cyanogen compounds are converted into ferrocyanide, and as the alkaline carbonate is converted into ferrocyanide through the action of the impurities in the gas, the fixed alkalinity of the solution disappears, which is an indication as to the completion of the action.

When the mixture absorbs cyanogen compounds no further, it is removed from the washer. It consists of alkaline ferrocyanides, excess of alkaline carbonate, insoluble ammonium ferrous-ferrocyanide, ferrous sulphide, and ammonia compounds. It is now passed through any suitable form of ammonia still, whereby the ammonia of the insoluble ammonium ferrous-ferrocyanide and other ammonia compounds is replaced by fixed alkali—the evolved ammonia being recovered by any suitable means.

The product from the ammonia still is next filtered, to obtain a clear solution of alkaline ferrocyanide, which may be purified before introduction into the cyanide still. The insoluble residue of alkaline ferrous-ferrocyanide, and other insoluble compounds, from the filtration described, are sent back to the washer, along with a further charge of the insoluble compound resulting from the distillation of hydrocyanic acid already referred to.

Obtaining Sulphur from Sulphuretted Hydrogen or Gaseous Mixtures Containing the Same.—Chemische Fabrik Rhenania, and Projahn, F., of Stolberg, Germany. No. 3122; Feb. 8, 1906.

Referring to Claus's patents Nos. 5958 and 5959 of 1883, the present patentees claim as a contact substance for use in a Claus kiln, wherein the gases are passed in a downward direction, bauxite, or a natural material of similar composition containing alumina, for the purpose of securing a greater yield of sulphur than that obtained by the use of the contact substances hitherto employed.

They say they have ascertained that bauxite (a hydrated aluminium iron oxide) develops in the Claus kiln, wherein the gases are passed in a downward direction, a considerably higher contact-action than the hydrated iron oxide hitherto employed. For instance, the sulphur lost in the waste gases from a kiln fitted with bauxite, which had been working a year-and-a-half, permanently amounted to but half the quantity lost in the waste gases from a kiln charged with hydrated iron oxide—the losses amounting only to about 5 to 6 per cent. of the sulphur contained in the gases to be treated. Besides, it is to be observed that, in all starting operations, if hydrated iron oxide is used as contact material, the losses of sulphur in the waste gases are greater than those experienced after the kiln has been working for some time, and the normal temperature has been attained; whereas, if bauxite is used, these losses are even smaller while starting the kiln than during the normal working.

Instead of bauxite, there may be used any other natural material of similar composition containing alumina, or an artificial mixture of alumina or its hydrate with artificial or natural metallic oxides or their hydrates.

APPLICATIONS FOR LETTERS PATENT.

13,022.—Garside, F., and Ellington, N. B., "Preventing reflux in water-mains." June 5.

13,161.—Wilson, W., "Gas-stove valves." June 7.

13,168.—Scott-Snell, C., "Incandescent gas lighting." June 7.

13,181.—Thorpe, C. P. E., and Dougan, O. W., "Mantles." June 7.

13,208.—Best, R. H., and Williams, H., "Gas-taps." June 7.

13,209.—Quetsch, F. G., "High-pressure incandescent gas lighting." June 7.

13,263.—Rosenberg, A., "Generation of acetylene." June 8.

Deep Well Boring in Chelsea.—Dr. Parkes gives an account in the June issue of the "Journal of the Royal Sanitary Institute" of a well sunk to a depth of 463 ft. 8 in. at the Chelsea Public Baths, to obtain water from the chalk, with a record of the strata traversed. The diameter of the steel bore tube is 13½ inches; and the tube is sunk to a depth of 260 feet from the engine-room floor, terminating 5 feet down in the chalk, which has been penetrated for a thickness of nearly 200 feet. The depth of London clay traversed was 148 ft. 6 in. The work was commenced on Sept. 14, 1905, and completed on Feb. 24 last. The water now stands in the boring at a depth of 120 feet from the surface. The average rate of sinking for the whole bore was 3 ft. 5 in. per day; but in the chalk the average rate was 4 ft. 3 in. The boring was done by a hand drill; four men being at work.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

The Examinations in "Gas Manufacture."

Sir,—I have pleasure in giving below the results of the examination in "Gas Manufacture," under the City and Guilds of the London Institute, held at the Municipal Technical School, Birmingham. Of the 40 students who sat for examination, 32 took the ordinary grade, and eight the honours grade, with the following results:—

	First Class.	Second Class.	Failures.
Ordinary grade	14	14	4
Honours grade	3	2	3
Total	17	16	7

Dr. Sumpner, the Principal of the Technical School, to-day expressed to me the opinion that for a new class the results are "good," and creditable alike to the class and the teacher.

I sincerely hope that the Examiner may live for ever, and, avoiding "boiling oil" on the one hand and "molten lead" on the other (to one or both of which I was beginning to feel he ought to be consigned), he will steadily persevere in maintaining, as he has set, a high standard in examination papers on "Gas Manufacture."

Rugby, June 16, 1906. C. Meiklejohn.

The Cheapest Gasholder.

Sir,—If I have misunderstood the purport of Mr. Herring's letter in the "Journal" for the 5th inst., I am very sorry; but I fear he has only himself to blame for writing in such ambiguous terms.

Let us examine the letter I ventured to criticize. In this, Mr. Herring says that he had some time ago "instituted a comparison based solely on the weight of material employed." A comparison of what? The discussion was headed "The Cheapest Gasholder," and related solely to the comparative cost per 1000 cubic feet capacity. The words immediately preceding the above extract are that it is "incorrect to attribute to design the entire credit for cheap construction." Hence I concluded—as I believe the majority of your readers would conclude—that the "comparison" he was alluding to, as based on the weight, was one of comparative cost—the cost per unit of weight, or (to adopt the usual formula) the "cost per ton of metal."

In my criticism, I used his own words, and said that I was surprised to see that Mr. Herring should adhere to the antiquated doctrine that the comparative cost of structures should be "based solely on the weight of material employed." Now, in his rejoinder this week, Mr. Herring says that "none but a demented person would have propounded such a theory" as that "the comparative cost of structures should be based solely on the weight of material employed."

I congratulate him on freeing himself from the imputation of such a theory; but it sounds somewhat inconsistent with what he had already written, until we read the next paragraph in his present letter, in which he explains that the point at issue, so far as he is concerned, "is the relative merits of gasholder design judged by the amount of material employed in their structure per unit of capacity per 1000 cubic feet, as distinct from their total cost;" or, in plain English, the cost is to be left out of it, and the weight per 1000 cubic feet of capacity adopted solely as the test of merit in design. But he did not make this clear in his first letter.

Assuming that my interpretation of his present meaning is correct, I venture to remark that weight alone, as a basis of comparison, is very unsatisfactory, inasmuch as two gasholders of equal capacity may be of exactly the same weight and alike in all "extraneous conditions;" and yet one shall, owing to extravagance of design, cost considerably more than the other. One man can, in designing, put two or three times the work into the same weight of structure as another designer would do. Hence weight alone is a fallacious test of the quality of design. If the element of cost be excluded, all other qualities of design—beyond getting a structure down to a minimum weight—stand for nothing.

The fact is, for a rough and ready rule, it is difficult to improve on the generally accepted standard of comparison—viz., "cost per 1000 cubic feet" of gasholders of equal capacity—without overburdening it with restrictions.

In using this rule, the broad facts as to relative cost of materials, situation, &c., are allowed to temper one's judgment to any required extent; but, as a basis to start with, the cost per 1000 cubic feet is not, with all its faults, a bad one. If greater exactness be required, the whole of the circumstances peculiar to each case, as affected by the eight factors I laid down in my last letter, must be considered.

Much of what Mr. Herring writes as to varying prices of materials &c., is but the A B C knowledge of gas engineers, and which no one ever dreamt of disputing. But he gains nothing in discussion by accusing his opponents of "compiling such nonsense," and the like expressions. As to the "nonsense" he refers to, practical men will see at once that I was not asserting that it was the usual practice at the present day to make gasholder columns or purifier plates double as thick as they ought to be, as Mr. Herring assumes; I simply took extreme cases, to illustrate clearly what I meant—cases, indeed, which have come under my own notice.

Mr. Herring says, in effect, "venture to misunderstand my Delphic utterances, or differ from me in opinion, and I shall demand an apology at once!" Men of known capacity, holding high positions, do not as a rule fear criticism. To suffer criticism is one of the penalties to be paid for being on a pedestal. I put what I considered a fair interpretation on Mr. Herring's letter. If I misunderstood him, it was due to his vague or ambiguous expressions—doubtless caused by an effort on his part to condense his ideas into a few words.

I think, however, we are all agreed that the "cost per 1000 cubic

feet" standard, the "weight" standard, and the "cost per ton" standard are all of them imperfect, and that no correct comparison as to the relative economy or merit of different designs can be made without a true knowledge, in each individual case, of all the factors I enumerated in a former letter as bearing on the cost. If this be acknowledged, this slightly breezy discussion may not be without fruit.

71, *King William Street, E.C., June* 16, 1906. F. S. CRIPPS.

P.S.—I have not attributed the phrase "cost per ton" to Mr. Herring's invention or authorship, as he seems to infer. The phrase is a very common one among gas engineers and contractors; and, therefore, it was put in inverted commas. It seemed to me to express briefly what appeared to be Mr. Herring's standard of comparison, in contradistinction to the "cost per 1000 cubic feet" standard. Hence its use.—F. S. C.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Kettering Water Bill, Metropolitan Water Board Bill, Tottenham and Edmonton Gas Bill.

Bill read the first time and referred to the Examiners: Local Government Provisional Orders (Gas) Bill.

Bills read a second time and committed: Ascot District Gas (Electric Lighting) Bill, Brixham Gas (Electric Lighting) Bill, Manchester Corporation Bill, Sutton, Southcoates, and Drypool Gas Bill.

Bills read the third time and passed: Gas Companies (Removal of Sulphur Restrictions) Bill, Southampton Gas Bill, Truro Gas Bill.

A petition against the Pontefract Corporation Bill has been presented by the Pontefract Gas Company.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Crediton Gas Bill, Newport Corporation Bill, Newtownards Urban District Council Bill.

Lords Bills reported: Bury Corporation Bill, Poole Corporation Water Bill.

Bills read the third time and passed: Kettering Water Bill, London County Council (General Powers) Bill, Metropolitan Water Board Bill, North Sussex Gas and Water Bill [Lords], Tottenham and Edmonton Gas Bill.

Petitions in favour of the Sutton District Water Bill have been presented by the London County Council, the Epsom Urban District Council, and the Provincial Water Companies' Association; and one against alterations by owners, &c., of mills and lands on the River Wandle.

On Thursday, Mr. H. C. Lea asked the Secretary of State for War whether there were any barracks in Great Britain still unlit by incandescent burners where gas is the illuminant; if so, what would be the cost of substituting incandescent light in those barracks; and whether he could carry out this reform to add to the comfort of our soldiers this year. Mr. Haldane informed the honourable member that the work of substituting incandescent for the ordinary gas-burners was proceeding as fast as possible, but that he was afraid it would not be possible to complete the work this year, as about £9000 would be required in addition to the sums already voted.

LEGAL INTELLIGENCE.

Water-Works and Income-Tax.

On Thursday last, Mr. Cordes, Government Inspector of Taxes, appeared before the Commissioners at Llangollen in support of a claim to assess the Council's water-works, on £246 for 1903-4, £425 for 1904-5, and £439 for 1905-6; the total amount of taxation being £54 10s. 4d. Mr. E. Foulkes Jones, the Clerk to the Council, appealed, and submitted that they were not liable for assessment for profits under Schedule II. of the Income-Tax Acts, inasmuch as no profits were made by them in connection with their water undertaking. He pointed out that the Council, when they fixed a water-rate, made an estimate of the sum they actually required for the maintenance of the works, and for the payment of interest upon loans, and so adjusted matters that they had no surplus from the rate over and above these charges. The Surveyor of Taxes claimed to assess the undertaking upon the amount raised by the rates, less the mere cost of repairs and maintenance. Mr. Foulkes Jones quoted authorities in support of the Council's contention that, under the Public Health Acts, they made no profit within the meaning of the word profit in the Income-Tax Acts. The Council urged the Commissioners not to allow the assessments, but to adhere to their decision in a previous appeal in 1899. Mr. Cordes' argument in support of the assessment was that the water-rate as levied is a non-compulsory rate, in that it is only levied upon consumers of water, and not upon every occupier in the district—that was to say, the Council could not compel every householder to take the water, if from other sources they secured an adequate supply. While highly complimenting Mr. Foulkes Jones upon the able manner in which he had marshalled the legal facts against the assessment, he contended that the Commissioners should uphold it. After a brief discussion, the Commissioners agreed in this contention, but disallowed £28 11s. 4d. of the original assessment, which now stands at £25 19s. for the three years.

A Faulty Gas-Meter.

At Pontefract, last Thursday, the Gas Company summoned a consumer named John Goodill for non-payment of his account, amounting to £3 10s., for the half year to December last. The Company admitted that the meter had proved to be 10 per cent. fast, and had therefore allowed a rebate of 10 per cent. to rectify this. The defence was that the meter was absolutely unreliable; the charges per half year having varied from 16s. 5d. to £3 10s., for what was asserted to have been regular consumption through an unchanged number of burners. Defendant said he had grumbled every half year, but had always paid his bills hitherto; and therefore he had "been robbed by the Gas Company." Alderman Wordsworth, a Magistrate, who, being a Director of the Gas Company, retired from the Bench during the hearing of the case, strongly demanded a withdrawal of this expression, and a wordy warfare ensued, during which another of the Magistrates left the Bench. Eventually, as the parties failed to come to an agreement, the Magistrates decided that defendant should pay for the half year in question the amount of his bill for the corresponding half of 1904—£2 6s. 5d.

Denham v. Globe Light, Limited.

This was a debenture-holder's action which came before Mr. Justice Joyce, in the Chancery Division, on Saturday as a short cause, there being no defence. Mr. Jessel, who appeared for the plaintiff, said the minutes were in the usual form in such cases; and his Lordship made the order accordingly.

Good Results at Loughborough.

At a meeting of the Loughborough Town Council yesterday week, the annual statement of accounts of the Gas Department was submitted. On the revenue account an expenditure was shown of £13,680, of which £10,653 was for the manufacture of gas, £1597 for distribution, £309 for public lamps, £489 for rents, rates, and taxes, and £632 for management. The sale of gas produced £16,087, residuals £2988, public lamps and services £354, and rent of stoves and slot installation £1253; making a total income of £20,682, and leaving a profit of £7002 on the year's working, as compared with £6626 in the previous year. Alderman Bumpus, moving the adoption of the report, said it was an extraordinarily good result, especially as they were now beginning to feel in a slight measure the effect of the competition of the electric light. The increased profit was due to the greater demand for slot installations and gas-cookers, but largely it was due to a steady increase in efficiency and management. From their profits they had been able to give £1500 in reduction of the rates.

Water-Works Disaster at Breslau.

It would appear from the "Gesundheits-Ingenieur" of May 26, as quoted in the Engineering Supplement to the "Times," that the new water-works at Breslau have recently been overtaken by a calamity which has rendered the service wholly unfitted for public use, and it has been necessary to revert to the former supply from the River Oder. On the occasion of a flood at the end of March last, air was drawn into the submerged syphons, and the water-level in the well sank about a foot. Measures were at once taken to extract the air from the syphons in order to avoid the interruption of the supply; and in 12 hours the level in the wells rose about 2 feet, so that it was again possible to distribute the full amount of water required. It was found that the syphons were quite water-tight, and it can only be assumed that in consequence of the spread of the flood water over the soil of the collecting-ground the air contained in the soil was compressed, and the level of the subsoil water was consequently depressed to such an extent that air was enabled to reach the sump and the syphons. When the air was exhausted, the level of the water in the subsoil rose about 31 inches; but the dissolved iron in the wells increased at the same time in a single day from 9·18 milligrammes per litre to 101·49 milligrammes per litre—thus rendering the water unfit for use. It was possible by air filtration to greatly reduce the dissolved iron; but the water also contained much manganese in solution, which could not be eliminated. The experts consulted are wholly unable to explain the causes for this sudden change in the quality of the water. It is feared that the manganese may give rise to the growth of the *Crenothrix polyspora*, the fresh water alga which caused so much trouble in the case of the Berlin water supply. As the dissolved iron and manganese are decreasing by degrees, it is hoped that before long the water will be again fit for use.

Fatal Gas Suffocation Cases.—Some days ago, in Liverpool, an elderly woman named Mary Allen was found unconscious in bed, and subsequently died, as the post-mortem examination showed, from the effects of coal gas. She was in the habit of sleeping with the door and windows securely fastened; and after her death one of the Gas Company's officials found that the chimney was also stopped up, so that fresh air was practically excluded from the room. One of the taps of a three-light chandelier was discovered to be turned partly on; and at the inquest deceased's husband suggested that she had accidentally done this after extinguishing the light. On Thursday, a widow who lived alone at Norwich also died under somewhat similar circumstances; but in this case the gas had permeated the whole house, a tap having being found turned full on in the living room, while deceased was discovered unconscious in her bedroom. The Jury brought in a verdict that death was due to suffocation, caused by an accidental escape of gas.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS QUESTION.

A Committee of Investigation Appointed.

No meeting of the Nottingham City Council had in recent years been looked forward to with greater interest by the ratepayers than that which (as was briefly recorded in last week's "JOURNAL") was held on Monday, the 11th inst. The *agenda* contained a large number of important matters, including the annual reports of Committees, and proposed expenditure of £20,000 on new sewerage works and £24,000 on new schools; but the question of supreme importance was the position of the gas undertaking and the relations existing between the Gas Committee and their Engineer (Mr. J. H. Brown). The quality of the gas supplied to the consumers has been a frequent source of complaint in Nottingham for the last four years; and in 1903 the Gas Committee called in Sir George Livesey, who recommended, among other things, a reduction of the candle power of the gas, and the appointment of a Consulting Engineer; the latter suggestion being made on the ground that Mr. Brown, who was appointed Gas Engineer in October, 1902, had no experience in the management of large works. The former recommendation was acted upon, but not the latter. The reduction of the candle power was followed by a largely increased number of complaints by consumers; and in the early part of last winter the local Chamber of Commerce made representations to the Committee on the subject of the indifferent heating and illuminating qualities of the gas supplied. The question was also raised in the Council Chamber; and as the outcome of the agitation, the Committee again called in Sir George Livesey to report upon the condition of the undertaking. His second report was received on or about May 26th; and the full text was published in last week's "JOURNAL." The announcement was previously made that the Gas Committee had considered the report, and, as the result of differences of opinion existing among the members, the Chairman (Mr. E. Harlow) had tendered his resignation. Later it was stated that two other members of the Committee—Alderman J. Jelley and Mr. R. Sands—who shared the Chairman's views, had also resigned. This remarkable development in the situation invested the meeting of the City Council with special importance; and, as events proved, the anticipation of further sensational developments was well grounded.

At the commencement of the meeting, which was presided over by the MAYOR (Mr. A. Cleaver),

Mr. BUTLER inquired whether he was in order in asking if the late Chairman of the Gas Committee would be allowed to make a statement in reference to the resignation of certain members of the Committee, or on the report of Sir George Livesey.

The MAYOR replied that the matter had not come on yet.

The TOWN CLERK later on submitted the following letters:—

June 1, 1906.

Dear Sir Samuel,—As I intimated to the members of the Gas Committee at the meeting held this morning, I beg to tender my resignation as Chairman and as a member of that Committee. I have most carefully thought out the whole question, and feel it incumbent upon me to take this step, seeing that the advice which I gave to the Committee this morning on a most critical matter was not followed, and I cannot associate myself with a policy of further delay. I shall be much obliged if you will kindly present this, my resignation, at the next meeting of the City Council.—I am, &c., (Signed) EDWARD HARLOW.

To the Town Clerk. *June* 1, 1906.

Dear Sir,—Will you please inform the Town Council that I decline to serve on the Gas Committee from this date.—Yours faithfully, (Signed) JOHN JELLEY.

June 1, 1906.

Dear Sir Samuel,—I beg to tender my resignation as a member of the Gas Committee, and I will be glad if you will place the same before the next meeting of the Town Council.—Yours faithfully, (Signed) RICHARD SANDS.

Mr. BUTLER at once moved the suspension of the standing orders, to allow Mr. Harlow to make an explanation.

This was seconded and agreed to.

Alderman BRIGHT interposed with the suggestion that, as there was going to be a motion submitted that the whole of the circumstances should be investigated by a Special Committee, it would be better if Mr. Harlow reserved his statement until the Special Committee submitted their report upon the whole facts to the Council.

Mr. BUTLER, on a point of order, said the Council had just given their sanction to Mr. Harlow to make a statement; and, in the interests of the whole Council, the matter ought not to be delayed one minute.

Alderman BROWNSWORD said he voted under the impression that it was a question whether the resignations should be accepted or not.

Alderman FRASER retorted that no vote was required upon such a question. It was open to any member of the Committee to resign when he thought fit, without the approval of the Council. It was only a matter of common ordinary courtesy to allow Mr. Harlow to state the reasons for his resignation. What he said was, of course, a matter of his own personal responsibility.

Mr. HOUSTON concurred. The gas question, he said, was absorbing the attention of the whole of the Nottingham community at present; and now was the time for Mr. Harlow to make his statement.

The MAYOR said it was the wish of the Council to hear Mr. Harlow.

Mr. Harlow's Statement.

Mr. HARLOW said that for several years past serious and almost continuous complaints had been made as to the quality of the gas. The Engineer attributed the cause of the complaints in general to defective burners and fittings of the consumers, and to the fact that some of the mains had, by reason of carelessness in the past, been laid without reference to the general plan of distribution. The Gas Engineer was appointed in October, 1902, at a salary of £750 per annum. He commenced his duties early in 1903; and in December of the same year his salary was increased to £1000 per annum. In the report of the Gas Committee as to the appointment of the Gas Engineer and Manager, presented to the Council on Oct. 6, 1902, it was stated—

> "Your Committee have specially stipulated that Mr. James H. Brown should give the whole of his time to the service of the Corporation, and that he shall not take pupils or have any other occupation or business whatsoever; and it has been specially pointed out to him that he would not be allowed to give advice to any other corporation or company."

At the time of Mr. Brown's appointment, Sir George Livesey was instructed to inspect and report on "the methods of manufacture and the commercial aspects of the undertaking." In his report, Sir George Livesey said—

> If the Nottingham Gas-Works were in the hands of a company, and I were Chairman, I should keep the Engineer to the engineering and gas managing side of the business—placing the commercial part in other hands, as at Sheffield. With so large a business as at Nottingham, he would then have full occupation. I am sure that in many cases, I might say nearly all, boards of gas companies and gas committees of corporations have a very imperfect idea of the great variety and importance of the duties of the engineer of a large gas undertaking such as at Nottingham. It is essential that the engineer should be in close and constant touch with the actual working and managing of the works.

Sir George also emphasized the necessity of the Chief Engineer being the actual Manager of one of the works; otherwise he was out of touch with the work and the management. He continued—

> At Nottingham, a new Engineer has just been appointed. I do not know him or anything about his engineering capacity or the work he has done. I have not the slightest objection to a young man being placed in a responsible position, if he has the necessary capacity, knowledge, and experience; the last being an important qualification for the management of a large gas undertaking. How are the Committee, unless the Chairman is an expert, to know whether the advice of their chief officer is sound? I do not wish to suggest the contrary in the smallest degree; for I know nothing against the new Engineer. But the interests of which he is in charge are too great to justify the running of any needless risks. In all questions of character, it is right to place confidence in a man unless there is a reason to believe him to be unworthy of confidence; but in matters of pure business, a man may justly and fairly be required to prove his capacity before being trusted with the absolute control of a great undertaking. In every case where I have had to give advice, and where I have found the engineer or manager to be a capable man, I have always recommended his board or his committee to let him do all their work without a consulting engineer. I cannot make such a recommendation in your case, unless there is on your Committee a gas expert of large experience. If not, you certainly need, for a time at least, the assistance of a gas engineer thoroughly acquainted by practical working with all modern developments in gas manufacture.

In his report of 1906, now in the hands of the Council, Sir George Livesey said that in 1903 he suggested the appointment of a consulting engineer, on the grounds that Mr. Brown had no experience in the management of a large works. "On looking back," he said, "I think it would have been better had some gas engineer of long experience in large works been available for reference and occasional consultation."

EXPERIMENTS WITH WATER GAS.

It might be assumed that Mr. Brown carefully weighed over the opinion of Sir George Livesey with regard to the difficulties of the task before him, especially as he undertook, not only the engineering duties, but also the commercial side of the business, and that he would consequently give his whole attention to the duties before him. On looking back, it appeared that the Engineer apparently commenced to experiment with water gas immediately upon his arrival in Nottingham. In the paper read by him at the annual meeting of the Institution of Gas Engineers, held in London on June 1, 1905, the following sentences appeared:—

> Considerable time and trouble were experienced in connection with these experiments and records at Ilford, with the idea of publishing them at some future period; but finally they had to be abandoned, owing to the writer's removal to Nottingham. He determined, however, that the matter should not be allowed to rest, and immediately any favourable opportunity presented itself he would obtain a complete and reliable record of the results of mixing blue water gas with the coal gas during carbonization. . . . On arrival at Nottingham, the author found that there existed a very complete coal-testing plant, capable of carbonizing 10 or 12 tons of coal per day; and immediately adjoining this small complete gas-works was a "Furness" oil-gas plant. He at once commenced to reconstruct the oil-gas plant, and to get the coal-gas plant into working order for making these experiments. For a short period experiments were made with a "methane-hydrogen" water-gas plant, with varying results. Finally it was decided to reconstruct what remained of the two plants and to generate sufficient blue water gas in a small experimental water-gas plant, which was constructed for the purpose. . . . In conclusion, the writer feels that an apology is due to the Institution for presenting a paper of such inordinate length; but the subject is one which will not allow very much abridgment. . . . It will be obvious that an enormous amount of time and trouble has been expended on the preparation of the paper.

It would appear from this, and from a minute which he would refer to later, that this special work was commenced in the year 1903. The

paper was read on June 1, 1905; the preparation and experiments apparently occupying a period of about two years.

OUTSIDE WORK.

In addition to the time and thought which the Engineer acknowledged to have been given to the preparation of the paper, he found that a minute was passed on April 14, 1905, as follows:—

> The Engineer reported that the Holyhead Gas Company were in a difficulty with regard to certain processes of manufacture; and they had asked him to advise with reference thereto. Resolved that he be authorized to do this.

This permission was given at a time when he (the speaker) was on a holiday; and it was not until the work was practically finished that he heard anything of it. When taken to task over it, the Engineer acknowledged that the work was finished in August. Now, on June 23, 1905, an application was made to allow the Gas Engineer to advise the Sutton in-Ashfield (Notts.) District Council in the construction of a new retort-house; but this permission was not granted. It thus appeared that, in spite of the arduous duties the Engineer was called upon to perform in the conduct of the gas undertaking, other exacting and difficult duties were at the same time entered upon.

CRISIS IN THE HISTORY OF THE UNDERTAKING.

Towards the end of last November, and early in December, the attention of the Council was called to the very inferior quality of the gas which was being supplied. Matters once more became acute; and a crisis in the history of the undertaking was reached. He, as Chairman of the Committee, called upon the Engineer to draw up a report on the whole question, and to advise the Committee what steps should be taken to remedy the state of things which existed. The Engineer's report was presented to the Committee at a meeting on Dec. 8, 1905; but the only advice he gave was to carry out certain alterations at the gas offices in George Street, in order that complaints with reference to defects of supply could be made to a clerk from the Engineer's office with a technical knowledge, instead of to the clerks under the Gas Accountant. After that report had been read, he (Mr. Harlow) pointed out to the Committee that, notwithstanding the seriousness of the position, the Engineer had not suggested a remedy which would be of any service in improving the quality of the gas; and he proposed from the chair that the Engineer should be instructed to supply gas of not less than 16-candle power, and that no blue water gas be used in the manufacture. Another member asked for a rider to be added that no experiments in the manufacture of the gas should be made without the definite authority of the Committee. This was unanimously agreed to. The Engineer was much upset by the attitude of the Committee. On the evening of the same day, he discovered that at the Eastcroft works inferior gas had been sent out for some considerable time—it was said chiefly during the night. This was the adulteration of the gas with air, or air mixed with furnace gases, to which Sir George Livesey referred in his last report. Personally, he had little doubt that much of the trouble had been caused by the adulteration of the gas with blue water gas at the Basford works, and by the introduction of furnace gases at the Eastcroft works. In a conversation he had with Sir George Livesey, he told him that it was most difficult to mix blue water gas with ordinary coal gas—that it was something like an attempt to mix oil with water, and the probable effect would be that the water gas would float about the mains in patches. The same was true with regard to furnace gases. Previous to that, and on several occasions, he asked the Engineer if he thought he had enemies in the works who were tampering with the make or with the governors; and on one occasion he (Mr. Harlow) mentioned that he had received private information that the gas was being tampered with at the Eastcroft works. The Engineer assured him that it would be impossible for such a thing to occur, as he would at once detect anything of the kind in the gas. Gas mixed with air would burn in a peculiar manner, which could and would be at once detected. In addition, the oversight given at the works, the ordinary chemical tests which were made, and the extremely delicate tests which were in constant action throughout the 24 hours at five separate places in the city, would easily detect the most minute trace of impurity in the gas.

MR. BROWN ASKED TO RESIGN.

On his being acquainted with what had been happening at the Eastcroft works, he at once had a special meeting of the Committee summoned to deal with the question. The discovery was reported to the Council; and it was subsequently decided to call in an expert to report upon the condition of things generally. The minutes showed that the Committee gave permission for some experiments to be made, and for outside work to be done. But on carefully considering the minutes, he was of opinion that the Committee had not any idea of the magnitude of the work which they had authorized. His reason for making this statement would, he thought, be gathered from the following minute, which was passed on July 9, 1903, with reference to the installation of the water-gas plant:—

> Memorandum from the Lighting Committee *re* naphthalene. The Engineer suggested he should be authorized to put down an experimental water-gas plant at the Eastcroft works, the cost of which he estimated at about £1000, with the view of seeing if such plant would remedy the matter complained of. Resolved that the suggestion of the Engineer be agreed to, subject to the cost of the works not exceeding £1000.

It thus appeared that the experiments in water gas were proposed as a possible remedy for naphthalene trouble. Another minute, dated Oct. 20, 1904, read as follows:—

> Resolved that the Engineer be authorized to engage houses for the temporary accommodation of three chemical assistants at the Basford works, and to pay them 15s. per week each for the extra expenses incurred by them while carrying on the special work in which they will be engaged.

He did not think any member of the Committee had any idea that the special work in which the chemists were engaged was in connection with the experiments with blue water gas. For the twelve months previous to last December, he (Mr. Harlow) might say that he had confidence in the Engineer; and members would recollect that he had supported that opinion with no uncertain voice. But the events which occurred about that time—the end of last year—proved, he thought conclusively, that something was wrong. He at once commenced a searching investigation of what had been done during the past few years, with a view of ascertaining the cause of the continuous complaints by gas consumers, and if possible to find a remedy. The result was that he formed the opinion, which might be right or wrong, but which was the result of long and patient thought, that it was unfortunate the Engineer had not given his sole and undivided attention to the management of the great undertaking of which he had charge, as expressly provided at the time of his appointment. In conversation with the Engineer a few minutes before the meeting at which it was decided to call in an expert, the Engineer voluntarily said to him that, if the Committee would select Sir George Livesey as the expert to report on the undertaking, he (the Engineer) would place his resignation in his (Mr. Harlow's) hands as soon as he had the report of Sir George Livesey in his possession. He might say that he had some weeks previously asked the Engineer to tender his resignation. He reported the Engineer's promise to the Committee; and it was decided to call in Sir George Livesey. On receipt of Sir George Livesey's report, he at at once telephoned the Engineer telling him that he had received it. This was on Saturday, May 26. The Engineer expressed a desire to at once see the report; but this he (Mr. Harlow) declined. On the following Tuesday, the Engineer came to see him; and he reminded him of his promise.

THE COMMITTEE AND SIR G. LIVESEY'S REPORT.

In conclusion, Mr. Harlow related to the Council what took place at the meeting of the Gas Committee when Sir George Livesey's report was received. The Committee, he said, met on the Friday following; and he attended the meeting without having received the Engineer's resignation. At that meeting, he first dealt with Sir George Livesey's report. He then pointed out the additional work which had been accepted by the Engineer during the period their own undertaking had suffered so severely because of the manufacture of bad gas. On these grounds, he proposed from the chair that Mr. Brown be requested to forthwith tender his resignation to the Committee. The Committee met at twelve o'clock, as he had before said, to specially consider this report. By one o'clock several members had left the room; and the majority of the remaining members of the Committee decided that it would be better to adjourn the meeting. He offered, by way of compromise, to adjourn until the following morning; but this did not meet with approval, and it was ultimately decided to adjourn. He then stated to the Committee that he was sorry that they did not think well to follow his advice. He had very carefully thought out the whole question during the last six months; and the proposition he had made was his deliberate judgment. Further, he could not see his way to accept the responsibility of having no policy, or a policy of drift, and that in consequence he should tender to the Council the resignation of his membership of the Committee. This had been a very disagreeable and unpleasant task to him; he had only done it because, as a member of the Committee, he deemed it his duty to do so, however painful that task might be. He thought it would be granted that he had not hastily formed his opinions or acted precipitately in suggesting the adoption of what he considered the best way out of the very acute and serious difficulties under which the Committee had been, and were still, labouring.

A COMMITTEE OF INVESTIGATION APPOINTED.

At the conclusion of Mr. Harlow's statement,

Alderman JELLEY said the Council would not be surprised that other members of the Gas Committee had resigned. He did not think they would be satisfied until they heard more with regard to the Engineer.

Mr. SANDS entirely concurred with what Mr. Harlow and Alderman Jelley had said; and he endorsed Mr. Harlow's views.

Alderman FRASER thought that any discussion would be at the present moment out of order; and he therefore gave notice that at the next meeting of the Council he would move:—

> That a Special Committee of this Council be appointed to investigate and report upon the present condition and working of the gas undertaking of this city and of any improvements or alterations necessary to be made therein, with full powers to terminate the service of, or to appoint, any official or officials of such undertaking, and to obtain any expert or other advice or assistance which such Committee may consider desirable; and that such Special Committee do consist of five members.

This was seconded; and, after some discussion,

The TOWN CLERK said he thought the Council should appoint the Committee that day, or they would have to call a special meeting of the Council to do so; and then there would have to be another meeting of the Council to consider the report.

Mr. BLACK suggested that the Committee should be appointed there and then. They had heard certain statements that day; but some of those present might have very different views.

Alderman FRASER said if the Council were prepared to appoint the Committee without discussion, he would accept the suggestion.

Mr. BLACK said the Committee would have a very difficult and delicate task, and would require careful thought; and if Alderman Fraser had not the members in mind——

Alderman FRASER said he had. He was prepared to move the Committee, on condition that there was no debate.

It was understood that this course should be adopted; and accordingly the standing orders were suspended.

Alderman FRASER then moved that the Committee should consist of Alderman Sir John Turney, Alderman Sir J. T. M'Craith, Alderman F. R. Radford, Mr. W. H. Carey, and Mr. W. H. Blackburn.

This was seconded and agreed to.

Mr. T. WARD asked whether, seeing that the three retiring members were the "cream" of the Committee, he would be in order in suggesting that they should be requested to withdraw their resignations temporarily.

The MAYOR said that a Committee had been appointed from the Council to deal with the matter.

PUBLIC LIGHTING OF SOUTH SHIELDS.

Adoption of the Incandescent Gas System.

A Special Meeting of the South Shields Town Council was held on Thursday to consider a report presented by the Parliamentary, Gas, and Water Committee in regard to the public lighting of the town.

Alderman LAWSON, in moving the adoption of the report, said it contained an entirely new arrangement with regard to the public lighting. It would be known that before 1886 the price of gas for the public lamps was fixed by Act of Parliament. Under their statutory powers, the Gas Company charged the Corporation 1s. per lamp per week, or £2 12s. per annum. In addition there was a further charge of 3s. 6d. per annum for cleaning and upkeep, making the annual cost £2 15s. 6d. per lamp. In 1886, the Company obtained powers to revise the price by mutual arrangement with the Corporation, or, failing this, by arbitration. But though they were granted this power in 1886, they had never acted upon it; nor had the Corporation taken any advantage of it, and the old price and conditions had prevailed. However, with the recent developments in connection with gas illumination, incandescent lighting, &c., the Company had recently applied to the Corporation to have the price revised. Before attempting to negotiate for the Corporation, the Committee naturally approached the Electricity Committee, to see whether they could light the streets and districts now lighted by gas. They were told, however, that it was not within the power of the Electricity Committee to take this business in hand, owing to the great cost which would be involved in having to lay cables in all the streets where there were none at present, and the consequent prohibitive price which would have to be charged for lighting the town. Under these circumstances, they had had no option but to negotiate with the Gas Company. They had various meetings with the Directors, and ultimately they had come to a settlement; the Company having accepted the last proposed terms of the Committee for incandescent lighting. This settlement was one which would last for a minimum period of three years. The position was this: The old system of flat-flame gas-burners has been costing the town £2 15s. 6d. per lamp per annum. For the same lighting, the Company wanted £3 1s. per lamp per annum. Their original demand was for £3 10s.; but it was reduced to the minimum of £3 1s. They had, however, negotiated on the desirability of having incandescent burners, and had agreed upon a price of £2 18s. per lamp, which would include the renewal of mantles, lighting, and cleaning. This would be a great improvement upon the present system. The flat-flame burner now in use had an illuminating power of from 14 to 16 candles; the electric incandescent burners were equal to 32-candle power; but the incandescent gas-burners they were getting were of 60 to 70 candle power. They were therefore obtaining an incomparably better and superior system of lighting for 2s. 6d. per lamp per annum more than they were paying now. They might safely assume that when the streets were lighted by lamps of 60-candle power, South Shields would be one of the best-lighted towns in the North of England. The financial position as between the various systems was this: They had 2126 lamps fitted with ordinary flat-flame burners. They paid on 709 for partial burning, at the rate of £1 19s. 6d. each, an annual sum of £1400; and on 1417 for full lighting, at £2 15s. 6d. each, £3931; making a total annual cost of £5351. For the same system of lighting under the new arrangement, the minimum price would be £6177; being made up of 709 lamps at £2 12s. 4d. and 1417 at £3 1s. The arrangement accepted would cost only £5865—that was, 709 lamps at £2 9s. 6d., and £1417 at £2 18s. Moreover, the price they had agreed upon was what might be called an elastic one; they would get the benefit of any reductions made in the price of gas. If the price went down 1d. per 1000 cubic feet, they would get the benefit of a reduction of £97; so that if the figure should be lowered to what it was during the year 1886—viz., 2s. 3d.—the cost to the town would be decreased by about £500 per annum. With regard to the cost of converting the present lamps into incandescent lamps, it would amount approximately to £3600. Then there would be a certain proportion of the ordinary pillars that were not strong enough nor good enough to carry the new and larger lamps, and 100 or 200 of them would have to be renewed. They had put down £400 for this, which made the total cost for conversion £4000. They proposed to ask the Local Government Board for power to borrow this amount; and they would probably be allowed five, ten, or fifteen years in which to repay it. But if they compared the figure of £6177 which the Gas Company would charge them for the present system and that of £5865 which they had agreed upon for incandescent lighting, they would find a difference of £312 in favour of the latter. This would help them to pay the interest and sinking fund on the £4000. With this superior light, it might be that in new streets they would require fewer lamps, and this could be considered in connection with the making of new streets.

Mr. J. M. SMITH, in seconding the motion, commended the decision of the Committee.

Some discussion ensued, in the course of which objection was raised to the Council "tying their hands" to gas lighting for a long period. But it was pointed out that they did not do this in any sense. The agreement was for three years only; and if at the end of this time it was found expedient to do so, the Council could convert the lamps as quickly as they wished. The report was unanimously adopted.

The Geltsdale Arbitration Award.—At the monthly meeting of the Carlisle Town Council last Tuesday, the recommendation of the Geltsdale Water Committee with reference to the award of Mr. John Farrer, to which reference was made last week (p. 716), was adopted after a somewhat heated discussion, in the course of which an assurance was given that every member would have an opportunity of seeing the opinion of Mr. Balfour Browne, K.C., and Mr. Ernest Page on the case to be submitted to the High Court, and that the Council would also have an opportunity of discussing the whole matter before any further legal proceedings are undertaken.

WIDNES GAS AND WATER SUPPLY.

Further Reduction in the Price of Gas.

At the Meeting of the Widnes Town Council last Tuesday, the minutes submitted by the Gas, Water, and Electricity Committee contained the following resolution: "That, from and after the 1st of July prox., the price of gas be reduced as follows to ordinary consumers inside the borough: To consumers of 3 million cubic feet and upwards per annum, from 1s. 2d. to 1s. 1d. per 1000 cubic feet net; to consumers of under 3 million cubic feet per annum, from 1s. 4d. to 1s. 3d. per 1000 cubic feet net; to consumers for motive power purposes, from 1s. to 11d. per 1000 cubic feet net. [The term 'net,' as mentioned above, means payment within one month from the end of preceding quarter; otherwise the price is increased by 2d. per 1000 cubic feet.] To slot consumers inside the borough, from 40 cubic feet to 44 cubic feet per 1d."

Alderman H. SUTTON TIMMIS, in moving the adoption of the minutes, said that the net profit on the gas-works during the past financial year, considering it as an ordinary trading concern, and after making the usual allowances for sinking fund, depreciation, &c., was £4703. On the water-works account the profit was £563. From the gas-works profit, the sum of £1915 must be deducted for the cost of public lighting for the last municipal year; and out of the water-works profit £291, the net cost of the Fire Brigade Department for the same period. The Committee were of the opinion that the gas profits justified them in proposing the reduction in the price of gas to consumers inside the borough. The profit on the gas supply for the past year was less than that of the two preceding years, on account of the falling off in the receipts from the residual products; but it was hoped that the reduced price would lead to increased consumption, which would restore the profit to the former level. A large reduction was being made to the slot-meter consumer, who would now pay for his gas the same as the larger consumer who had his supply through an ordinary meter. Previously he paid a little more, because he had his fittings for nothing, and there was greater cost in collecting his money. Up to the present, the slot-meter consumer had 40 cubic feet of gas for his penny, which was the largest quantity ever given in this country for that sum. The average was 20 cubic feet; and one town gave only 13 feet. So that 44 cubic feet for 1d. beat anything which had been given before. It was a great advantage to working men and others in Widnes. He should like one fact to go to the world and be rather emphasized. What did this price for gas mean to the town? It meant that Widnes gave to its inhabitants comfort in their homes and private life which they could not get elsewhere. It meant that gas could be used during the hot months for cooking and other purposes, which was a great advantage. The most important point was what it meant to the people who used gas for motive power. The cost of gas for this purpose worked out at 11d. per 1000 cubic feet—91 cubic feet for 1d. This quantity in an engine developing a duty of 1 brake-horse-power on a consumption of 15 cubic feet of gas was equal to 6-horse power per hour for 1d., which was cheaper than any moderate-sized installation of steam power, electricity at ½d. per unit, or any of the types of the new suction gas plant so much advertised. Motive power for use in works was cheaper in Widnes than in any town in the British Islands. There were corporations who talked about electricity at 1d. per unit; but not one was selling it at less than 2d.

Alderman WAREING seconded the motion.

Mr. BULLOGH said there were many complaints about the quality of the gas; but it was as good as, and even better than, it was in most towns in the kingdom. He thought people grumbled about the gas because of its cheapness. If it were 2s. 6d. per 1000 cubic feet they would have a better report. In many cases he thought the cause of complaint was to be found in the fact that the pipes laid in the houses were of insufficient capacity. When people could not get the gas into their burners, they blamed the engineer and the supplier of gas.

Mr. HURST asked how it was that in a town where gas was 3s. 1d. per 1000 cubic feet people could get a better light for less money than they could at Widnes. He had a son at Leigh who formerly resided at Widnes, and he was now living in a house similar in size to the one he occupied in Widnes. Gas was 3s. 1d. per 1000 cubic feet at Leigh; but for a quarter corresponding with one taken during the time he resided in Widnes, his son found his gas bill to be less. The same number of rooms were lighted in the house; but the gas was better, and fewer burners were required.

Mr. BOYLE said he was acquainted with the manager of a shop in Widnes belonging to a limited company who had a shop of similar size in Runcorn; but the gas bill there was lower than the Widnes bill. He had recommended his friend to ask the Engineer (Mr. Isaac Carr, M.Inst.C.E.) how it was.

Mr. LEWIS said he knew of another limited company who had shops in Runcorn and Widnes, and who found that Widnes gas was more economical than that at Runcorn. He thought there was an acknowledgment due from the Council to the Committee and their able Engineer, when their record with regard to the price of gas was considered. He had not observed any striking tone of gratitude in the remarks which had been made, though he thought the consumers would feel some to the Committee for having made further concessions to them. He hoped, at the same time, that as long as the price of the gas remained a record one, the Committee would pause before they attempted to use their profits in further reductions. He was no advocate of proposals to take the gas profits for the general purposes of municipal administration; but he thought that an estate of such a character might be useful for contributing to some purpose of local improvements—perhaps something in the shape of luxuries, with which the rates would not otherwise furnish the town. As both a consumer and a ratepayer, he thought they had reached the limit in the cheapness of gas, unless their position was seriously threatened.

Alderman TIMMIS said he appreciated the remarks of the last speaker, and accepted the acknowledgment on behalf of the Committee. He also would make a mental note with regard to what Mr. Lewis had said about any further reductions. Of course, £1915 for public lighting and

£291 for the Fire Brigade had been taken from the profits, and went forward for the public benefit during the past year. The first-named sum would be exceeded in the next municipal year, as it was proposed to lay new mains in the streets. The Committee at present contributed something like 4½d. in the pound to the relief of the rates. He had listened carefully to the remarks of Mr. Boyle and Mr. Hurst, and had been quite unable to grasp what they meant or proved. In the case Mr. Hurst had quoted, if they had known the respective quantities of gas consumed by the people at Leigh and at Widnes, they might have drawn some conclusion. Perhaps they used candles or electricity—he did not know. He was shortly going to a house where he hoped the gas bill would be less than it was at his present house—he was going to use electricity. In conclusion, he said that at the last census, in 1901, there were 5350 houses in the borough; but perhaps there were rather more now. There were 1925 ordinary and 3758 slot meter consumers. Altogether, the meters in use numbered 5683—that was to say, 333 more meters than there were houses in the town. This was accounted for by the fact that some houses were let out in flats, and each flat had its own meter. The value of the reduction in price amounted to £1500, which would go into the pockets of the consumers, and could be spent as they chose.

The minutes were adopted.

GAS-WORKS RESULTS AT SOUTHPORT.

When moving the adoption by the Southport Town Council of the minutes of the Gas Committee, Alderman Travis made reference to the annual report of the Manager (Mr. John Bond), some particulars from which were given in the "JOURNAL" for the 5th inst. (p. 657). He pointed out that there had during the past year been an increase of 18 million cubic feet in the sales of gas, and said this was owing largely to the extra number of cookers taken up. Considerable alterations were proposed at the gas-works, by which they would practically have new retorts. He hoped two-thirds of this work would be completed by the autumn; and the members of the Council would then be able to see what the new works would be like before the remaining buildings were pulled down. They looked forward to making more gas from the same amount of coal. The Council would see that, while on the capital account the total amount expended stood at £283,000, the gas-works debt stood at £206,000; the balance having been paid off. The total capital expended per 1000 cubic feet of gas sold was 12s. for the year 1906, against 12s. 3d. for the previous year; and the total capital outstanding was 8s. 9d., as against 9s. 2d. The net sum received from the sale of gas was £2492 more than in the previous year. On the expenditure side, under the heading of carbonizing material there was a decrease of £363, while in salaries and foreman's wages there was a decrease of £13. With two exceptions the past year was the best they had had. But in one case the gas was sold at 3s. 3d. per 1000 cubic feet, and in the other at 3s.; while now the price was 2s. 8d. This, he thought, was very satisfactory. He had every reason to believe they would keep this up. Any profit they made, would be used in such a manner that it would be to the benefit of the gas consumers later on; but before they reduced the price, they meant to have the undertaking in an up-to-date state. He should like to congratulate Mr. Bond on his year's working. He was a most efficient Manager, and had the entire confidence of the Committee. They were very pleased indeed with last year's work.

On Feb. 20, the Southport Corporation Gas Committee placed with Messrs. Robert Dempster and Sons, Limited, of Elland, a contract for taking down three roofs, two of 50-feet span, and one of 21-feet span, and all 142 feet long, and for supplying and erecting cast-iron columns, joists, &c., for carrying the roofs, from the ground level to a 15 feet higher level than previously, and also for re-erecting the old roofs. The essence of the contract was that it should be completed within eleven weeks; a heavy penalty being fixed for every day the time was exceeded, while a bonus was to be paid for each day the contract was completed under the time stated. The contract was finished to the satisfaction of everybody concerned in fourteen days under the stipulated time. Since then, the same firm have been entrusted with the building of eleven through arches, a new chimney, &c., also with a penalty and bonus clause, all to be finished within six weeks. This contract was completed eight days under the stipulated time.

WIGAN CORPORATION GAS SUPPLY.

The Past Year's Working.

The Gas Engineer and Manager to the Wigan Corporation (Mr. Joseph Timmins, M.Inst.C.E.) has lately presented his report on the working of the gas undertaking in the year ended the 31st of March last. It opens with the statement that the high efficiency of the works was maintained during the period covered. The quantity of coal and cannel carbonized was 38,493 tons; and the production of gas was 436,818,000 cubic feet—an increase of 1398 tons, or 3·77 per cent., and of 14,512,000 cubic feet, or 3·43 per cent., as compared with the preceding twelve months. The quantity of gas sold was 409,977,300 cubic feet, of which 42,245,600 cubic feet were consumed through slot meters. The increase in the total sales was at the rate of 3·78 per cent., and in the prepayment sales at the rate of 28·71 per cent. During the year, a large number of coins other than pennies were found in the money-boxes of the meters. They had been deposited there by the consumers principally for safety, and in some cases to meet the payment of the bill for laying on fittings. The gross profit for the year was £27,388, compared with £26,185 in the preceding twelve months; the net profit being £6286, against £7056. Mr. Timmins explains, however, that the public lighting in the year lately closed represented a sum of £4805; and this item added to the net profit raised it to £11,091. The cost of coal and cannel last year was 9s. 9½d. per ton; and the revenue from residuals was 8s. 1½d. This brought the net cost of coal and cannel down to 1s. 8½d. Taking the period since the works have been in the hands of the Corporation, the average cost of coal and cannel has been 10s. 4½d. per ton, and the revenue from residuals 6s. 7d. per ton.

The total consumption of gas last year was 409,977,300 cubic feet, compared with 395,046,400 cubic feet in the year 1904-5; being an increase of 14,930,900 cubic feet, or 3·78 per cent. Mr. Timmins regards this as eminently satisfactory, seeing that in the preceding year there was a decrease of 981,900 cubic feet. Taking the quantity of gas consumed for private purposes, the figures for the past year are 360,230,500 cubic feet, compared with 349,683,700 cubic feet in 1904-5—an increase of 10,546,800 cubic feet, or 3·01 per cent. This again is gratifying, coming as it does after a decrease of 2,626,000 cubic feet. The gas used in the public lamps was 49,746,800 cubic feet, which was a 9·66 per cent. increase on the year 1904-5, due to the change from electric to gas lighting. For cooking and heating purposes, there was an increase in consumption equal to 3·9 per cent.; and for motive power to 3·46 per cent. The gas used for these purposes represents 15·84 per cent. of the total sales.

Mr. Timmins acknowledges that the returns do not show the revenue to be quite so good as that of the preceding year by £180. He points out, however, that this is more than covered or accounted for by the difference in the receipts for residuals—viz., 9d. per ton of coal carbonized, which on 38,493 tons represents £1443. He concludes by thanking the Chairman and members of the Committee for the support and encouragement he has at all times received from them, and by bearing testimony to the loyal co-operation of those of the staff who are associated with him in conducting the various operations of the gas undertaking.

COVENTRY GAS AND WATER SUPPLY.

The accounts of the Gas and Water Departments of the Coventry Corporation for the year ending the 31st of March last have already been briefly noticed; but the following are some additional particulars in regard to the financial positions of the undertakings.

The total capital expenditure on the gas undertaking since its acquisition by the Corporation, including the original purchase-money, amounts to £335,178; and the balance of capital in hand is £91,381. The total revenue for the past year amounted to £116,757, and the expenditure to £93,369; leaving a gross profit of £23,388. To this has to be added the amount brought forward (£785), and the interest allowed by the bank and interest from the Barnsley Corporation (£2533); making a total of £26,706. Against this are capital and other charges amounting to £19,135; leaving a final balance of £7571. The amount in the reserve fund (which the Council have prescribed at a maximum of £10,000) is at present £9870. With regard to the disposal of the balance of profit, the Gas Committee recommend that £2000 should be paid over to the district fund; that £5000 should be set aside to meet the loss of capital consequent upon the abandonment of plant at the old gas-works when the new ones at Foleshill are in full operation—this sum making, with those set aside in 1904 and 1905, £10,000 towards the £50,000 estimated by the Engineer and Manager (Mr. Fletcher W. Stevenson, M.Inst.C.E.) as the total amount of loss; and that the balance of £571 should be carried forward. The Committee report that they have had under consideration the present scale of charges for gas. They are of opinion that, in view of the very large augmentation of consumption and the increased profit, the present time is opportune for making such a reduction in the scale of charges as will benefit all classes of consumers, and enable the undertaking to compete with the producer plants for the manufacture of gas for motive power and industrial purposes recently put upon the market. The Committee recommend the adoption of a scale which will give a reduction of 1d. per 1000 cubic feet to all consumers up to 200,000 cubic feet per quarter, and a reduction varying from 2d. to 4d. per 1000 cubic feet to those consuming this quantity and upwards per quarter; the reductions to take effect as from the commencement of the current quarter.

The accounts of the water undertaking show that the receipts from water-rents amounted to £16,287, compared with £15,318 for the year 1904-5. This figure is the highest in the history of the undertaking. The expenses came to £7556, which is a decrease of £854 compared with the preceding year; the saving being chiefly in the item of repairs. The balance of revenue over working expenses is £9144, to which must be added the bank interest of £74, making a total of £9218. The capital charges were £5188; leaving a net profit of £4030, against a profit of £2166 in the year 1904-5. The unappropriated cash balance on the 31st of March last was £5011, and the profits for the current year are estimated at £3279. The Water Committee recommend that £4000 of the balance in hand should be paid over to the borough fund in aid of the next two borough rates, in equal portions.

MIDDLETON CORPORATION GAS SUPPLY.

The Engineer's Report.

In the account of the past year's working of the gas undertaking of the Middleton Corporation which appeared in the "JOURNAL" last week, it was mentioned that the annual statement was not ready; but the Chairman of the Gas Committee (Mr. Mills), in presenting the minutes, gave a few figures as to the make of gas, and so forth. These did not show the exact position; and as we have now the report of the Engineer (Mr. E. E. J. Anderson), we extract from it the following particulars.

Beginning with the capital account, Mr. Anderson states that it was kept low last year; all alterations being placed to the revenue account. This amounted to £22,374—an increase of £292 compared with the twelve months ending March 31, 1905; but the gross profit was only £6552. The annual charges, annuities, &c., came to £6324, which is nearly £1100 more than in the case of other gas-works of similar size.

The quantity of gas manufactured was 126,758,000 cubic feet, of which 113,505,100 cubic feet were sold and 2,377,600 cubic feet used on the works, &c. The total accounted for was consequently 115,982,700 cubic feet; showing a deficiency of 10,775,300 cubic feet, or 8·5 per cent. In the year 1904-5, the gas made was 122,970,000 cubic feet, and that sold 110,436,700 cubic feet; so that there was an increase of 3,788,000 cubic feet in the make and of 3,068,400 cubic feet in the sales. Both of these increases are quite satisfactory; but the unaccounted-for gas was rather higher than before, being 8·5 per cent. against 8·09 per cent. This is accounted for by a considerable number of mains being broken; and though the cost of the repairs to them was charged, nothing was put down for the estimated loss of gas. There was a heavy drop of 202 in the ordinary meters; but, on the other hand, there was a gain of 322 in those of the prepayment class—making a net gain of 120 consumers. The popularity of this system is shown by an increase of 4,508,000 cubic feet in the gas thus consumed last year. There was an additional quantity of 287 tons of coke for sale; but, owing to the sluggish market during the winter months, there was a falling off of £190 in the revenue. Tar was a source of anxiety, as the price fluctuated considerably. Though there was an increase of 94 tons in the quantity made, the revenue was £80 less; and Mr. Anderson says the decrease would have been greater had a sliding-scale not been adopted. There was an improvement in the yield of ammoniacal liquor and sulphate of ammonia; but prices were unfavourable, and there was a loss of revenue of £48. During the past year there were a large number of alterations and renewals, &c., for which expenditure was incurred which will not appear in the current year's accounts; so that a considerable reduction under this head may be expected. In the statement of receipts, expenditure, &c., accompanying the report, it is shown that the undertaking has been passing through difficulties. In the year 1901-2, there was a loss of £3725, which was followed by losses of £962 and £570 in the two succeeding years. In 1904-5, however, there was a change for the better, and a net profit of £789 is shown; and to this is added £228 for the year covered by the present accounts. Mr. Anderson's working statement shows that, per ton of coal carbonized, the coke sold was 11·21 cwt., the tar made 15 gallons, the ammoniacal liquor (10 oz.) produced 27·06 gallons, and the sulphate of ammonia made 24·71 lbs. last year, compared with 10·25 cwt. of coke, 13·13 gallons of tar, 26·18 gallons of liquor, and 22·52 lbs. of sulphate in 1904-5. Mr. Anderson closes his report with an expression of regret that he was compelled to absent himself a good deal from his duties last year; and he thanks the Committee for the kindness shown to him during the whole of this period. The management of the undertaking, coupled with domestic affliction, appears to have seriously affected his health; and, acting under medical advice, he has tendered his resignation of his position.

LAST YEAR'S WORKING AT DONCASTER.

The statement of working of the Doncaster Corporation Gas Department for the year ending March 31, is a very satisfactory one. The gas sold amounted to 187,325,700 cubic feet, as against 180,922,400 feet for the previous year; while the quantity unaccounted for was reduced from 8 53 to 6·7 per cent. Though practically the same amount of coal was used (20,072 tons, compared with 20,056 tons in the previous year), the total make was 204,078,000 cubic feet, as against 200,577,000 feet; the make per ton having risen from 10,010 cubic feet to 10,167 feet, while the quantity sold per ton also increased from 9028 cubic feet to 9322 feet. There are now 1539 cookers on hire; and of the total of 8092 meters out, 4492 are ordinary and 3600 prepayment. The cost into the holder per 1000 cubic feet of gas sold (after deducting the receipts for residuals) was reduced last year from 1s. 2·47d. to 1s.; while the net cost distributed was brought down from 1s. 8·42d. to 1s. 6·76d. The gross profit on the present occasion is £9790, compared with £8401; the net profit, after deduction of interest, sinking fund, &c., being £8547, against £7669. Of the surplus, £4500 has been paid over to the borough fund.

SWADLINCOTE GAS SUPPLY.

At the Meeting of the Swadlincote Urban District Council last Tuesday, the abstract of the accounts for the year ending the 31st of March was presented. The Gas Manager (Mr. G. B. Smedley) also submitted his report. He stated that 1274 yards of new gas-mains and 17,217 feet of service-pipe had been laid in the district. As the result of the introduction of slot meters, 567 houses had been connected on the free-fittings system; and 248 grillers were in use. The accounts of the gas undertaking showed a revenue of £11,367, and an expenditure of £6640; leaving £4727 to go to the profit and loss account, on which there was a net profit of £971. The Gas Committee recommended that this amount should be set aside towards defraying the cost of the free fittings; and they suggested that a reduction of 3d. per 1000 cubic feet should be made in the price of gas to all consumers. Mr. Belfitt moved the adoption of the report. Mr. Howard criticized the action of the Committee, and said he failed to see where the profit of £971 came from, as there was an overdraft of £2200 at the bank. The Clerk (Mr. W. A. Musson) explained that an amount of £1971 had been allocated for free fittings, and had been spent. Mr. Stevens said that, according to the report, the Council had made 44,531,000 cubic feet of gas, and had sold less than before. He took exception to the revenue account, and said the Committee could only show an increase of £67 in the profit. The Clerk pointed out that there was an unpaid balance on the free-fittings account, and that therefore it was the right thing to use the £971 to reduce it. After some further discussion, the report was adopted with the exception of the Committee's recommendation; and it was decided to engage an expert to examine the balance-sheet to see what profit had, in fact, been made. Mr. Stevens gave notice that at the next meeting he would move that the price of gas remain at 4s. 2d. per 1000 cubic feet.

PORTSMOUTH CORPORATION AND THE WATER-WORKS.

The Agreement for Purchase Adopted.

The proposed acquisition of the undertaking of the Portsmouth Water Company by the Corporation came directly before the shareholders at a special meeting held last Friday, under the presidency of the Chairman (Mr. W. Grant, J.P.). The draft agreement for the purchase was explained by Mr. T. A. Bramsdon, the Company's Solicitor, who went *seriatim* through the 28 clauses. The greatest interest was centred in the stipulation that £25 of Corporation 4 per cent. stock should be given for every £10 share on which 10 per cent. was now received, £12 10s. for each £5 share on which a similar dividend had been paid, £8 15s. for each £5 share on which 7 per cent. was received, and £6 5s. for each £5 share on which 5 per cent. was received. Mr. Etherington said that by purchases of shares which he had made for himself and as a trustee nearly £100 would be lost. The Chairman thought the Company could not call upon the Corporation to give to each proprietor the full value of his investment; but he might say that the proper quotation of the stock ought to be 110, which would be better for the shareholders. Mr. Dixon pointed out that the Corporation would only grant 4 per cent. instead of 3½ per cent. stock, because the latter would be more advantageous to the Corporation themselves.

It was provided by the agreement that the sum of £19,131 19s. 8d. should be received to pay back-dividends; the various descriptions of shares being allotted respectively £1 14s. 7d., £1 13s. 9d., 10s. 7d., and 1s. 11d. per share. There was no discussion on this clause.

The references to the payment of £11,812 10s. and £945 as compensation to Directors and Auditors, brought out some adverse comments; but the clause was received, as was also one relating to the pecuniary compensation of the officials. The Corporation further agree to pay the Company £7000 for necessary expenses, and to complete the purchase within two years.

The Chairman finally moved the adoption of the agreement, to which, he said, the Board had given unremitting attention for eight months. They unanimously believed that the shareholders would be wise to accept it. The Deputy-Chairman (Lieut.-Col. Owen) seconded the motion. Mr. G. T. Cunningham remarked that thirty years ago the proposition was before the Town Council, of which he then was a member, but it fell through. He believed at that time that the water supply should be in the hands of the Local Authority; and he still thought so. If the Corporation kept to their agreement, he considered the arrangement would be very fair. The voting was practically favourable to the adoption of the agreement; the dissentients numbering only five.

DEVONPORT WATER-WORKS TRANSFER.

At the Meeting of the Devonport Town Council last Thursday, the Town Clerk (Mr. R. J. Fittall) reported that the Umpire in the arbitrations respecting the purchase of the water undertaking (Mr. A. J. Ram, K.C.) had, on the instructions of the Water Company and the Corporation, made an award, according to the agreement entered into, for the Corporation to pay £244,000 as the purchase price of the undertaking, including costs. It appeared from the minutes of the Water Committee that the Town Clerk, the Borough Treasurer, and the Water Engineer had met the Secretary and Engineer of the Company, and had arranged the details relating to the transfer of the undertaking. They agreed for the Corporation to take over the plumbing stores at a price to be agreed between the two Engineers; for the Corporation to pay the Company £250, the costs incidental to the winding-up of the Company and the distribution of the assets; for the Corporation to give the Company the use of a room and access to the books, to enable them to wind-up the Company; for the Corporation to take over the water-rents unpaid on June 30, 1906, at a price to be agreed upon; for the Company to hand over the balance of the capital account (this amounted to £1700 on Dec. 31, 1905); and for the Company to hand over the stores purchased out of capital account, which were valued at £1967 on Dec. 31 last.

Mr. Paul suggested that, as the Corporation were about to take over an undertaking which would cost the town £250,000, the members of the Council should have an opportunity of visiting and inspecting the works, so that they might know what it was that they had bought, and understand the proposals for development. Mr. Banbury thought the Council ought not only to have some idea of what they had bought, but should visit the source of the supply; for there was a probability that they would be asked to lay out £200,000 or £300,000 in the development of the water property. If they knew what they had become possessed of, they would be better able to appreciate any schemes which might come before them for extensions. Mr. Waycott suggested it would be better to postpone the visit until they knew what the Water Committee were going to propose.

Eventually the Council approved of the suggestion that a visit should be paid.

With reference to the capital for the purchase of the undertaking, the Finance Committee reported that they had made arrangements for an advance of £250,000 to the Corporation by the Capital and Counties Bank. Mr. Rendle said this was a new departure, and asked why the Committee had not followed the usual course of issuing stock. The Chairman of the Finance Committee (Mr. Banbury) said the time was not opportune for doing this, and it was better to make the arrangement with the bank.

Increase in the Price of Gas at Leigh (Lancs.).—The Leigh Town Council last Tuesday decided to raise the price of gas from 3s. 1d. to 3s. 3d. per 1000 cubic feet. Alderman Cowburn said the loss on the undertaking last year was £2862. Despite a reduction of 2d. per 1000 cubic feet in the price, there had been a decreased consumption of 5 million cubic feet, which he attributed to bad trade and competition in the Electricity Department.

THE DEEP WELL AND BORING AT LINCOLN.

Great Find of Water.

Reference has been made from time to time in our columns to the boring undertaken by the Lincoln Corporation, in accordance with the advice of Mr. Percy Griffith, M.Inst.C.E., F.G.S., of Westminster, their Consulting Engineer, with the object of providing the city with a better and more abundant supply of water. The operations have been attended with various vicissitudes which threatened to mar the success of the work; but all doubt was dispelled on the morning of Sunday, the 10th inst., when the red sandstone was reached, and a great outburst of water followed. We have already given particulars in regard to this boring; but, in view of its importance as a successful piece of water engineering, we reproduce from the "Lincolnshire Chronicle" for last Friday, the following complete account of the initiation and carrying out of the scheme.

It was as long ago as 1901 that a contract was signed with Messrs. C. Chapman and Sons, of Salford, for making the deepest boring for water in the United Kingdom; it being calculated that the earth's crust would have to be pierced to a depth of 2000 feet. It was anticipated that the water-bearing sandstone would be reached at a depth of 1400 feet; but the blue clays were 100 feet thicker than the estimate, and a depth of 1563 feet had been reached when the sandstone was scratched and water came.

Before this result was achieved, however, many difficulties had to be overcome. When the works had been about two years in progress, a great calamity occurred in the shape of the loss of the boring-tool at a depth of 885 feet. It was buried beneath material which caved in from the sides of the bore. After ineffectual efforts had been made to recover the tool, the sinking of the shaft was decided upon. It was not until March, 1905, that the tool was recovered; and it was then determined, owing to the looseness of the strata, to continue with the shaft, which eventually reached 1502 feet—the deepest and most remarkable water well in existence. For 1100 feet the diameter is 9 feet; the upper 400 feet being 12 feet across.

From the depth of 1502 feet a 3-inch pilot bore was sent down 61 feet. The wisdom of proceeding thus cautiously was abundantly demonstrated, for even from this small bore it was found impossible to effectually dam the supply; and the concreting of the bottom of the well was rapidly proceeded with. After much preliminary work nearer the surface, such as the fixing of the pump-guides, &c., boring operations proper were recently resumed; and eventually the great boring-tool, which had been cutting a 33-inch hole through the marls, struck the sandstone. A depth of less than 3 feet had been penetrated when the upheaval came. The great tool, weighing more than 2½ tons, seemed to be lifted bodily; and the roaring sound of the rushing water was distinctly heard on the surface. The tool was rapidly wound up, and the float lowered to gauge the speed at which the water rose. The first 13 minutes' actual measurement showed that the water had risen in the 9-feet well no less than 180 feet, and continued at a rapid rate until the 12-feet well was reached. The water continued to push its way upwards at the rate of about 12 feet per hour; and on Monday morning it was within 55 feet of the surface. At two o'clock on Wednesday morning it overflowed; and it has since that time been running to waste.

The calculations had been that the bore would yield about half the city's supply, which varies from 1½ to 2¼ million gallons daily. But the flow of water, now that the sandstone, through which it is proposed to bore for some considerable distance yet, has been pricked to the extent of only 3 feet at the most, indicates that, instead of being half, there will be more than double the requirements of the city; and the fact that it has already risen to the surface and overflows, shows the immense pressure behind it. How greatly expectations have been exceeded is evidenced by the fact that the preliminary work in the 12-feet well was designed and executed with the idea that the water would have to be pumped from a depth of 400 feet, where, as already mentioned, the well narrows to 9 feet in diameter. The most difficult operation to be performed now will be the fixing of the 30-inch tubes, to cut off the 58 ft. 6 in. of the marls which have been recently bored through. When this has been accomplished, the boring will easily proceed deeper into the sandstone.

The work has been attended with difficulty throughout. The Contractors have never, it is stated, had a tougher job in all their experience. But compensation is found in the fact that the supply tapped is far in excess of that anticipated. Mr. Griffith, who visited the bore on Tuesday, and again on Wednesday, did not conceal his entire satisfaction with the result. He endorsed the opinions of the Contractors that the experience is unique in the annals of well sinking and boring. He roughly calculated that when the water rose 180 feet in 15 minutes in the 9-feet well, the flow was at the rate of 7 million gallons per day of 24 hours. This, of course, is at a depth of approximately 880 feet from the surface. Putting the supply at the lowest, it will be some 2 million gallons per day at the 400-feet level, and this before the bore is deepened. This will be ample for the supply of the city; and the quantity available will be still greater as the bore proceeds. With regard to the quality of the new supply, Mr. Griffith says the great rush of water and the quantity behind it was to him a guarantee of the quality. This is based upon his general experience.

One of the Contractors made the following remarks to a Press representative early last week on the work which has now been so successfully accomplished: "It has been a weary fight. Delays which could never have been foreseen have occurred; but the result is splendid. The fight for water has been dogged and determined. What might at times have seemed insuperable difficulties have been overcome, and the result is beyond all expectations. Never has so deep a water well been sunk before, and never has there been such a yield of water on the mere scratching of the sandstone. We have completed borings giving 3, 4, or 5 million gallons per day; but never have we struck such a rich vein of water on the very surface of the sandstone. It is a beautiful quality of sandstone, and there can be little doubt as to the quality of the water. The result seems scarcely realizable to one who has had great experience of well sinkings and borings. When the water burst through, the noise was like thunder; and the sound had to travel through 600 feet of water which had risen in the well from the pilot-bore. When the 12-feet diameter well was reached, the water still boiled up from the centre—a striking indication of the tremendous power behind it." The pressure is estimated at 200 tons. There was no cessation of the flow of water over the top of the well at the end of the week. Some of the water was turned into an adjacent drain; and a hand pump has been fitted up to convey the surplusage to Witham. Arrangements are being made for accurately gauging the volume of the overflow, which it is confidently expected will increase as the well is cleared of sand.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The incident about the Corporation gas coal contracts of Glasgow has continued to occupy attention during the week, and only yesterday was a decision arrived at which may be said to close it for the present. The resolution of the Sub-Committee on Contracts to advertise for fresh tenders was laid before the full Gas Committee on Monday, and the announcement was made that the Committee sent the subject back to the Sub-Committee, to advertise for fresh tenders or otherwise. The Sub-Committee on Contracts met on Tuesday; and after deliberating on the subject for an hour, resolved to adhere to their former decision, and reported so to the parent Committee. On the day that this resolution was come to, a letter was written to the Editor of the "Glasgow Herald," and was published by him on Wednesday, over the signature "Semper Idem." The writer was manifestly intimate with his subject; and it was therefore of interest to learn from him that "it was common knowledge that about one-half of the total requirements were priced at figures which were deemed to be fair, and a selection of them were marked off for acceptance, when other counsels intervened, on the strength of certain coalmasters, orally and in writing, asking for the privilege of amending their respective offers. From this some members of the Contracts Committee infer that, by advertising again, and ignoring former tenders, they may be able to buy in a cheaper market." The writer went on to say: "Yes, perhaps, but at the loss of public decency! It will never be to the general credit if any representative institution penalize those who have quoted right for the sake of giving others who have quoted wrong a second chance. The Committee would be well advised if they confirmed such offers as are, in their Manager's judgment, just and reasonable, and re-enter the market at their own convenience for any supplementary supplies that may be required." It is almost a strange circumstance that what was suggested in the concluding sentence of this letter was what the Gas Committee, at their meeting on Wednesday, resolved to do. After a sitting of three-quarters of an hour, which was said to have been very lively, the Committee sent the subject back to the Sub-Committee to accept all the offers which were at reasonable rates, and to advertise for the balance of coal that might be required. The Sub-Committee met on Thursday, and, carrying out the instruction they had received, it was announced accepted offers for about 300,000 tons of coal, which was less than half the yearly requirements. In making this announcement, the "Glasgow Herald," in its commercial columns, made the statement: "We understand that the average price of the offers accepted is from about 3d. to 3⅛d. per ton over the average price paid last year." Then, to-day, the statement is made in the "Glasgow Herald": "The Gas Committee of the Glasgow Corporation met to-day [the article is dated on Friday] and unanimously approved of the recommendation which the Sub-Committee on Contracts agreed to at their meeting yesterday. As we had stated, the decision was to accept offers for about 260,000 tons of coal from those sent in, and to advertise for offers for the remainder of the requirements for the year, which amount in all to fully 700,000 tons. The proceedings were formal; the meeting only lasting five minutes. The statement in to-day's issue, that the average price of the offers accepted yesterday was from 3d. to 3⅛d. per ton over the average price paid last year, was slightly misleading. Over all, the average was as stated; but this, we are informed, was arrived at on account of the prices for the cannel coals bought being the same as last year, and in some cases rather less. With regard to coking, splint, and ell coal, we understand that the prices accepted showed considerably more of an increase over last year than 3⅛d. per ton."

In the monthly meeting of the Dumbarton Town Council on Wednesday, Provost MacFarlan said that, before proceeding with the business, it was appropriate and right that he should refer shortly to the loss the Council and community had sustained in the death of their oldest servant, Mr. James M'Gilchrist, who served them faithfully and well for the long period of thirty-two years. His worth had been spoken to in many other quarters, and he did not propose to address them at length; but they ought to be thankful that for such a long period they had had as their servant in the Gas Corporation a man who was in the forefront of his profession. The community of Dumbarton and the gas engineering profession were distinctly poorer to-day from the loss of this man, who served them worthily and faithfully so long. He moved that they express to Mrs. M'Gilchrist and the family their sense of these faithful services, and their condolence in the loss they had sustained. This was agreed to without comment.

The Council then proceeded to consider the position of the gas undertaking consequent upon Mr. M'Gilchrist's death. It was agreed that the financial department be placed in the hands of the Burgh Chamberlain. Over a proposal that the Town Clerk should be appointed Clerk to the Gas Committee there was considerable discussion, and it was ultimately agreed to give this arrangement a trial for a year. A good deal of conversation also arose upon the terms of the appointment of a Manager. The questions discussed were whether the salary should be £250 or £200; whether the new Manager should be allowed to do outside work; and whether they should advertise the appointment, or appoint an assistant to the post. The decision was to advertise; the salary to be £200; and that no outside work be allowed.

In the Dunfermline Town Council on Monday, it was reported that the quantity of gas made in the Corporation gas-works during the past year amounted to 113,262,200 cubic feet—an increase of 5,449,700 cubic feet on the make of the previous year; and that the gas accounted for amounted to 106,469,700 cubic feet—an increase of 4,334,300 cubic feet. Proceeding upon estimates which had been prepared by the Engineer—Mr. A. Waddell—the Gas Committee recommended that the price of gas should be reduced by 3d. per 1000 cubic feet, making it, for ordinary purposes, 2s. 6d.; for public lighting, 2s. 6d. less 10 per cent.; for prepayment consumers, 3s. 1d.; for heaters and cookers, 2s. 6d.; and for gas-engines, 2s. Bailie Stewart, the Convener of the Committee, in moving these recommendations and the adoption of the estimates, said it was owing to the enthusiastic character of the Manager that everything was kept up to date. When they took over the undertaking, the manufacture of gas was 66 million cubic feet per year. Now they had their output up to 106 million cubic feet, and the standing charges had been considerably reduced. Some years ago, with great reluctance on the part of some at least, a considerable capital expenditure was made at the gas-works, in connection with coal and coke-handling plant and the carbonizing department. In the year before this plant was put into proper working order, they expended 2s. 6d. per ton upon carbonizing; while last year the cost was 1s. 3d. per ton. The saving was close upon £822. Over and above this, the coal and coke handling plant had saved over £200, compared with the cost under the old system. There was a balance of £972 in connection with the handling of coal and coke. This was a figure which was entirely saved by the thought and energy given to the manufacture of gas by the Manager and those under him. As compared with the old prices, there was a saving to the community of £7192 a year. They had reduced the price from 3s. 6d. to 2s. 6d., and they had no fear of being able to make ends meet during the coming year. The motion was agreed to.

The results of the working of the Arbroath Corporation gas undertaking for the past year were submitted to the Town Council on Monday. The quantity of gas manufactured was 85,340,100 cubic feet—being an increase of 3,804,100 feet; the quantity sold was 77,113,595 cubic feet, or an increase of 3,670,282 feet. The yield of gas per ton of coal was 9772 cubic feet—an increase of 272 cubic feet. The total revenue from the sale of gas was £11,515—an decrease of £323, which was due to a reduction of 2½d. per 1000 cubic feet. Including gas sold for engines, for which there was also a reduction of 2½d., the total reduction in revenue was £561; but there was an increase in the revenue from gas consumed through prepayment meters of £238. There was an increase in the quantity of gas sold to ordinary consumers of 811,132 cubic feet; of gas sold for gas-engines of 29,500 cubic feet; and of gas sold through prepayment meters of 2,829,650 cubic feet. Unaccounted-for gas was equal to 7·3 per cent., as compared with 7·9 per cent. The number of prepayment meters now in use is 1955—an increase of 246. Tenders for coal were accepted as follows: 500 tons of Denbog shale, at 10s. per ton f.o.b. Methil; 500 tons of Bothwell washed double nuts, at 11s. 6d. per ton; 1500 tons of Swinhill Lower Drumgray double nuts, at 11s. 2d. per ton; 250 tons of Minto Hartley double nuts, at 10s. 2d. per ton; 100 tons of Climpy mixed nuts, at 10s. 2d. per ton; 500 tons of Bridgeness large unscreened coal, at 8s. 3d. per ton f.o.b. Bo'ness; 1000 tons of Dunnikier treble nuts, at 10s. 6d. per ton; 500 tons of Auchlochan washed double nuts, at 10s. 6d. per ton; 1000 tons of Shotts washed large nuts, at 11s. per ton; and 1000 tons of Banknock diamond double nuts, at 10s. 8d. per ton. The Gas Committee reported that they found, from the report of the Manager, that the average price of the new coal contracts indicated an increase of 6d. per ton over last year's prices, but that, owing to the quantity of coal in stock, and the quantity still to be received in respect of the old contracts, only about two-thirds of the increased price would fall on the current year. They also ascertained that, taking the average price during the past year of coal and benzol, including cartage into the works, the cost would amount to about 12s. 1d. per ton, after paying for all charges for manufacture, labour for handling, acid, and cartages. The gas-stove capital account, after allowing 10 per cent.—equal to £297—out of revenue for depreciation, had increased from £1703 to £2666. The number of cookers, grillers, and rings in use had increased from 935 to 1723. In moving approval of the minutes of the Gas Committee, Mr. George Anderson said that the quantity of gas made in 1902-3 was 70¼ million cubic feet; and it was now 85½ million cubic feet. Their works were in first-class order, and it was likely they would be maintained in as good condition, with no great unlooked-for expenditure. The minutes were adopted.

The salary of Mr. P. B. Watson, the Gas Engineer to the Wishaw Town Council, has been increased by £30 a year.

In the Kilsyth Town Council on Monday, Mr. Jarvie, the Convener of the Gas Committee, submitted the annual statement as to the working of the undertaking. The income for the year, including £92 brought forward, amounted to £4205. The ordinary expenditure amounted to £2919; repayment of loans and interest required £551; and a balance of £654 has been carried forward. It was agreed to reduce the price of gas from 2s. 8½d. to 2s. 6d. per 1000 cubic feet for ordinary purposes, and from 2s. 7d. to 2s. 3½d. for cooking and power.

The Grangemouth Town Council have now entered into full possession of the gas undertaking. On Monday, they appointed a Gas Committee, with Mr. Main, one of their number, as Convener. The Clerk submitted a letter from Mr. John M'Gilchrist, of Gourock, enclosing the notes by his father upon the valuation of the stocks on hand at the transfer. He also read a letter from the Liquidator of the Gas Company, enclosing the report upon the subject which he had received from Mr. A. Gillespie, of Glasgow; also the opinions of the Directors of the Gas Company, in which it was stated that they were prepared to accept Mr. Gillespie's award in settlement, although they considered it to be, in some respects, too favourable to the Town Council. Mr. Gillespie found a sum of £1445 due to the Gas Company. The Clerk reported that all the items in Mr. M'Gilchrist's notes tallied with those in Mr. Gillespie's statement. The Council agreed to accept the statement, and authorized the Burgh Chamberlain to pay the amount reported.

Lead-Poisoning at Mossley.—Owing to further complaints from the Mossley Town Council of lead-poisoning from the water supplied by the Ashton-under-Lyne Joint Committee, the Committee have resolved to make alterations in the plant so as to treat the water with lime. Strangely enough, there are no cases of lead-poisoning throughout a much wider area supplied by the Committee.

Gas-Works Extensions at Widnes.—At the meeting of the Widnes Town Council last Tuesday, the Finance Committee reported that they had received a letter from the Local Government Board in reference to the report of their Inspector (Colonel Hepper) after the inquiry held by him with reference to the application of the Council for sanction to the borrowing of £12,550 (reduced at the inquiry to £11,000), and enclosing sanction to the borrowing of £10,000 for gas-works purposes.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 764.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 11	7	Bombay, Ltd.. . . .	6⅞—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4⅞—5¼	..	5 6 8
50,000	10	Mch. 9	14	Bourne-) 10 p.c. . .	28½—29½	..	4 14 11
51,810	10	,,	7	mouth Gas) B 7 p.c. .	16½—17½	..	4 0 0
53,200	10	,,	6	and Water) Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Feb. 22	12½	Brentford Consolidated	263—268	..	4 13 3
300,000	,,	,,	9½	Do. New . . .	200—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref. .	123—128	..	3 16 11
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	103—106*	..	3 15 6
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	230—235	..	4 15 9
246,320	,,	,,	8½	Do. A. Ord. Stk. .	165—170	..	4 17 1
460,000	20	Apl. 11	10	British	42—43	..	4 13 0
100,000	Stk.	Feb. 22	6	Bromley, Ord. 5 p.c. .	121—124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—95	..	4 14 9
500,000	10	May 11	7	Buenos Ayres (New) Ltd.	12—12½	..	5 12 0
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
150,000	20	Mch. 9	8½	Cagliari, Ltd.	23—25	..	6 12 0
100,000	10	June 14	10	Cape Town & Dis., Ltd.	15½—16½*	..	6 1 3
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref. .	9¾—10¾	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Feb. 22	5⅛	Commercial 4 p.c Stk. .	113—115	..	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	110—112	..	4 9 3
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86*	+1	3 9 9
800,000	Stk.	,,	6¼	Continental Union, Ltd.	125—128*	..	5 1 7
200,000	,,	,,	7	Do. 7 p c Pref.	140—145*	..	4 16 7
452,070	Stk.	Feb.	5¼	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,090	10	Jan. 25	11	European, Ltd.	24—25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,223,235	Stk.	Feb. 8	4⅛	Gas-) 4 p.c. Ord. . .	97—98	..	4 9 9
2,600,000	,,	,,	3½	light) 3½ p.c. max. . .	87—89	..	3 18 8
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	108—111	..	3 12 1
4,193,975	,,	June 14	3	Coke) 3 p.c. Con. Deb.	86—85*	+2	3 8 2
258,740	Stk.	Mch. 9	5	Hastings & St. L. 3½ p.c.	100—105	..	4 15 3
£2,560	,,	,,	6½	Do. do. 5 p.c.	121—124	..	5 4 10
70,000	10	Apl. 11	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	May 11	8	Imperial Continental .	177—179	..	4 9 5
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Mch. 28	6	Lea Bridge Ord. 5 p.c. .	121—126	..	4 15 3
561,000	Stk.	Feb. 22	10	Liverpool United A . .	235—237	..	4 4 5
718,100	Stk.	Feb. 22	7	Liverpool United B .	169—171	..	4 1 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Apl. 2	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11—12	..	5 16 8
1,675,892	Stk.	Feb. 22	4½	Newc'tle & G'tesh'd Con.	109—111	..	4 3 4
406,625	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	99—101	..	3 9 4
15,000	10	Mch. 9	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	147—150	..	5 6 8
600,000	5	Mch. 28	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 26	7	Primitiva Ord. . . .	6⅞—7	..	5 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref. .	5⅜—5⅝	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
851,070	10	Apl. 26	7	River Plate Ord. . . .	12½—13	..	5 7 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	98—100	..	4 0 0
250,000	10	Mch. 28	8	San Paulo, Ltd. . . .	13¾—14¼	..	5 12 3
70,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—52	..	4 16 2
135,000	Stk.	Mch. 28	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	243—245	..	4 1 8
126,106	Stk.	Mch. 9	5½	Shrewsbury Ord. 5 p.c.	114—116	..	4 14 10
70,000	10	May 31	10	South African	15¾—16½	+⅛	6 1 3
6,250,000	Stk.	Feb. 22	5⅜	South Met., 4 p.c. Ord.	127—129	..	4 5 3
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Mch. 9	5⅜	S'th Suburb'n Ord, 5 p.c.	120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	..	3 16 11
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	May 11	5	Southampton Ord. . .	107—112	..	4 9 3
120,000	Stk.	Mch. 9	6¼	Tottenham) A 5 p.c. .	124—127	..	4 18 5
363,020	,,	,,	4¼	and) B 3½ p.c. .	99—102	..	4 13 2
137,500	,,	Dec. 14	4	Edmonton) 4 p.c. Deb.	103—107	..	3 14 9
182,380	10	June 14	8	Tuscan, Ltd., Pref. . .	10—10¼*	..	7 12 5
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Feb. 22	7⅜	Wands-) A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	133—136	..	4 11 11
75,000	,,	,,	5⅛	and) C 3½ p.c. . .	110—113	..	4 16 1
£9,416	,,	Dec. 29	3	Putney) 3 p.c. Deb. Stk.	83—86	..	3 9 9
745,872	,,	Mch. 9	5⅜	West Ham 5 p.c. Ord. .	107—109	..	4 14 0
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—125	..	4 0 0
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	106—109	..	3 13 5

Prices marked * are "Ex div."

CURRENT SALES OF GAS PRODUCTS.

Week ending June 16.

In the London market, pitch is undoubtedly in an improving position. Buyers have raised their limit more than once; but have not succeeded in purchasing their requirements in consequence of their proposals being still too low. So far as stocks and commitments are concerned, makers are very comfortable, and are therefore firm at 32s. net for next season, which is considered a reasonable figure in relation to the value of briquettes. It is reported that 60's crude carbolic acid has been done at 1s. 9¾d. net for forward delivery. Toluol and solvent naphtha are in strong demand for this and next year; but the quantity offering is small. Ordinary London creosote oil is quoted at 2¼d. for the best make. Sulphate of ammonia is still inactive, the official quotation being £12 5s. on Beckton terms.

Sulphate of Ammonia. LIVERPOOL, *June* 16.

There has been some improvement in the demand during the week, and a fair business has been done. The production was, however, sufficient to meet all requirements, and although the parcels placed upon the market were fairly readily taken up, no improvement can be registered in prices, which are somewhat irregular at the close at £11 17s. 6d. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. In forward delivery some business is reported for July-December, and quotations generally are £12 5s. per ton f.o.b. for this period.

Nitrate of Soda.

This article is steady at 11s. 1½d. per cwt. for ordinary, and 11s. 4½d. for refined quality.

Tar Products. LONDON, *June* 16.

The market for tar products remains very quiet; but this is doubtless owing in part to the considerable falling off in the production of tar. In pitch, there still appears a disire among makers to sell for prompt delivery, as they are evidently anxious to clear out stocks before the very hot weather sets in. London pitch could still be secured at from 27s. to 27s. 6d. for prompt. For next season the value is about 30s., and one of the largest makers reports having refused 29s. for forward delivery; while good prices are reported to have been offered to Yorkshire distillers. It will be difficult to ascertain the future of this article for some little time, as it is not yet known what will be the ultimate effect of the recent labour troubles in the North of France. In South Wales, consumers appear fairly well covered for both prompt and for delivery up to the end of the year; and they would not be disposed to consider any business except at low prices. As regards creosote, the demand in London remains good. There is a considerable inquiry for both prompt and forward delivery, and prices will probably be maintained for some little time to come, especially as there is a steady demand for creosote salts for shipment to America. It is reported that 1¾d. has been refused for London oil, and that 22s. 6d. was paid for salts for export. Anthracene remains absolutely unchanged, and there is nothing doing in this article. In solvent naphtha, the demand for home consumption remains good; but sales are reported in the North of England at rather lower prices, and there would seem to be more offering for forward delivery of ordinary 90 per cent. at 160°, and in more than one instance 1s. and under has been accepted up to the end of the year. Carbolic acid is quiet; and there does not apper to be any great desire to purchase crude now that the big crystal contracts have been arranged. The value of 60's remains about 1s. 9¼d. to 1s. 9½d., but without any demand, though a small parcel of 70's was sold on the east coast at equal to 1s. 11¾d. The values of crystals appear nominal, and may be taken as 6d. for 39-40 per cent., and 5¾d. for 34-35 per cent. There is not much business doing in toluol; but it is reported that London manufacturers realized 1s. 1½d. for a small parcel for home consumption. There is very little doing in benzol. Some 90 per cent. was sold for home consumption at equal to 9¾d. f.o.b. London; while business has been done in the North at 9d. to 9¼d., but quantities and particulars have not transpired. A small parcel of 50-90 per cent. was sold in the Manchester district at about 10¼d., and a London dealer reports having purchased at this price on the east coast.

The average values during the week were: Tar, 15s. 6d. to 20s. Pitch, London, 27s. to 27s. 3d.; east coast, 26s. 6d.; west coast, 25s. 6d. to 25s. 9d. Benzol, 90 per cent., 9⅜d. to 9⅝d.; 50-90 per cent., 10⅛d. to 10⅜d. Toluol, 1s. 1d. to 1s. 1½d. Crude naphtha, 3⅝d. to 4d.; solvent naphtha, 1s. 0¼d. to 1s. 1½d.; heavy naphtha, 11½d. to 1s. 0¼d. Creosote, London, 1⅝d.; North, 1½d. to 1⅝d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9¼d. to 1s. 9½d. Naphthalene, £5 to £9; salts, 21s. 6d. to 22s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market for this article is still very quiet, and there is little or no business doing. In London, the principal Companies still maintain their nominal quotation at £12 5s.; but without doubt a firm offer of something under £12 would be accepted by other makers. In Leith, the market remains fairly steady, and the ruling price may be taken as about £12 2s. 6d. Business is reported in Hull at from £11 17s. 6d. to £11 18s. 9d., while a small lot was sold at £11 16s. 3d. for immediate delivery. In Liverpool, there is no business of any importance to report, and the price may be taken as from £11 18s. 9d. to £12.

At the meeting of the Bulawayo Water-Works Company, Limited, last Friday, the Chairman (Colonel the Right Hon. A. R. M. Lockwood, M.P.) stated that the cash position was a satisfactory one, the Company having £26,000 invested in sound securities. The gross profit on the sale of water and electric current was £7990.

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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The Lancashire coal pits, which were closed for the Whitsuntide holidays, reopened some on Monday and some on Tuesday, the 11th and 12th inst. Extra deliveries had been made during the week preceding Whit week, in order to be prepared for possible emergencies. There was, therefore, no immediate demand for coal on the resumption of work, so that business was resumed on ordinary conditions. Coal-owners have not deemed it advisable to induce sales of house coal by offering at less than current rates. Steam coal continues very firm on the plane of the February increase; and no new contracts are entered into except at an advance. The same is true of gas-coal contracts. Quotations at the pits are: Best house coal 13s. to 14s. per ton, secondary 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 11d. to 8s. 9d., best slack 6s. 9d. to 7s. 6d., medium 6s. 6d. to 7s. 6d., common 5s. to 6s. Coal for shipping on the Manchester Canal is 9s. 6d. to 10s. 6d.

Northern Coal Trade.

There has been a greater demand in the coal trade of the North; and with rather heavier exports, the collieries have had full work, though for one or two kinds of fuel requirements are naturally limited at this time of the year. Steam coals are now being shipped more freely—the Baltic demand being good. Best Northumbrian steams are about 10s. 6d. per ton f.o.b., second-class steams are steady at from 9s. 9d. to 10s., and steam smalls are about 6s, with a tolerably good inquiry. In the gas coal trade, the home consumption is now limited; but some of the chief users are beginning to enlarge their demand, taking advantage of the period of low sea freights. There is, too, a full export of coal. Prices vary from about 8s. 9d. to 9s. 9d. per ton f.o.b. for Durham gas coals, according to quality; and it may be expected that a steady increase in the demand will soon set in. As to gas-coal contracts, that for Turin has been allotted, with two prices; one for 12,000 tons, at about 16s. 4½d., at Savona, and the second for about 48,000 tons, to be delivered after the removal of the tax, at about 1s. per ton less. The coke trade is steady; and gas coke, being in limited production, is in rather less stocks, while the price shows no great alteration.

Scotch Coal Trade.

Trade is still in that condition which may be described as lifeless. The shipping trade is suffering, at least temporarily, by the prospective withdrawal of the coal-tax; but there is a suspicion also that the home trade has not continued long in the booming condition it offered to develop a month or two ago. On account of the dearth of shipping orders, it is reported, some collieries are not working full time. The quotations are: Main 7s. 6d. to 7s. 9d., ell 8s. 6d. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 240,327 tons—a decrease of 2565 tons upon the previous week, but an increase of 5244 tons upon the same week of last year. For the year to date, the total shipments have been 5,799,599 tons—an increase of 664,473 tons upon the corresponding period of 1905.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards placed three new issues of capital by order of Directors. The first lots consisted of £15,000 of 5 per cent. ordinary stock of the South Essex Water-Works Company, carrying a dividend at the rate of 4 per cent. per annum (free of income-tax) as from the 1st prox. It was all sold at from £100 to £102 per £100. A few £10 ordinary 7 per cent. shares in the Worthing Gas Company fetched £14 10s. to £15 each; and some new ordinary £10 shares (£4 4s. per cent. paid on similar shares) in the Westgate and Birchington Gas Company, £10 to £10 5s. apiece. On Thursday, Mr. George Nichols, of the firm of Messrs. George Nichols, Howes, Young, Alder, and Co., sold by auction, in accordance with the announcement in the "JOURNAL," £30,000 of 5 per cent. general capital stock and £10,000 of new debenture stock bearing interest at the rate of 4 per cent. per annum of the Bristol Gas Company. Mr. Nichols, in his opening remarks, drew attention to the continuous growth of the Company during the past 43 years, and to the present low price of gas—2s. and 1s. 9d. per 1000 cubic feet, compared with 4s. 6d. in former days—and to the great development of the use of gas for cooking and heating purposes. He stated that the present issue of stock was called for in consequence of the extension of the works, which meant the increase of business. There was a large attendance, and the bidding was very brisk. The general stock, consisting of 300 lots, realized £35,095 15s., or an average of £116 19s. 8½d. per £100; and 100 lots of new debentures, £10,333 15s., or an average of £103 6s. 9d. per £100. The total amount obtained for the £40,000 of stock offered was £45,429 10s.

Burton-on-Trent Corporation Gas Undertaking—At the meeting of the Burton-on-Trent Town Council last Wednesday, the Mayor (Alderman Lowe), in submitting the report of the Gas and Electricity Committee, called attention to the fact that there had been a small increase in the quantity of gas sold, for which, he said, the Committee were glad. It appeared that affairs had reached their worst, and were likely to improve if the sale of gas was any indication. The Committee asked for powers to accept tenders for coal, in order to facilitate business, as they had practically settled a tender at a small advance. This involved an increased outlay for coal of about £400 for the year. But there was a tendency for the price to advance, and consequently there should be no delay. The report was adopted. The undertaking has suffered from the low price of residuals; and this has made a difference of something like £500 in the receipts. There is, however, a consolation in the fact that the consumption of gas is steadily increasing.

CARBURETTED WATER-GAS APPARATUS

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Buffalo, N.Y.	2,000,000	Newcastle-on-Tyne	1,800,000
Windsor St. Works, Birmingham	2,000,000	Winnipeg, Man.	500,000	Leeds	1,800,000
Saltley Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Malton	150,000
Colchester	300,000	York	750,000	Smethwick	500,000
Birkenhead	2,250,000	Rochester	500,000	Gravesend	300,000
Swindon (New Swindon Gas Co.)	120,000	Kingston, Ont.	300,000	Pernambuco, Brazil	125,000
Saltley, Birmingham (Second Contract)	2,000,000	Crystal Palace District	2,000,000	Duluth, (Second Contract)	300,000
Windsor St., Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Leicester (Second Contract)	1,000,000
Halifax	1,000,000	Caterham	150,000	Newport (Second Contract)	250,000
Toronto	250,000	Leicester	2,000,000	Brockville	250,000
Ottawa	250,000	Enschede, Holland	150,000	Toronto (Third Contract)	750,000
Lindsay (Remodelled)	125,000	Buenos Ayres (River Plate Co.)	700,000	Montreal, Ont. (Second Con.)	1,800,000
Montreal	500,000	Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
Toronto (2nd Cont., Remodelled)	2,000,000	Kingston-on-Thames	1,750,000	Hamilton, Ont.	400,000
Belleville	250,000	Accrington	500,000	Rochester (Third Contract)	1,600,000
Ottawa (Second Contract)	250,000	Tonbridge	300,000	Leeds (Second Contract)	900,000
Brantford (Remodelled)	200,000	Stretford	500,000	Buenos Ayres (Primitiva Co.)	1,200,000
St. Catherines (Remodelled)	250,000	Oldbury	300,000	Buenos Ayres (New Co.)	1,200,000
Kingston, Pa.	125,000	Todmorden	500,000	Christchurch, N.Z.	300,000
Peterborough, Ont.	250,000	Saltley, Birmingham (Third Contract)	2,000,000	Rochdale	1,600,000
Wilkesbarre, Pa.	750,000	York (Second Contract)	750,000	St. John's, Newfoundland	250,000
St. Catherines (Second Cont.)	250,000	Rochester (Second Contract)	500,000	Brantford (Second Contract)	400,000
		Newport (Mon.)	250,000	Smethwick (Second Contract)	500,000
		Tokio, Japan	1,000,000	Pontypridd	250,000
				Montreal (Third Contract)	1,800,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG,

American Municipal Trading Inquiry.

Several more visits to gas-works were paid last week by the Commissioners of the National Civic Federation of the United States. Last Tuesday they went to Sheffield, where, on proceeding to the Gas Company's head offices, they were received by the Chief Engineer (Mr. J. W. Morrison) and the Secretary (Mr. Hanbury Thomas). After a visit to the show and store rooms there, the party proceeded in cabs first to the Effingham Street works, then on to the Grimesthorpe works, and lastly to the Neepsend branch. The deputation visited Leicester on Thursday; and on Friday they were at Birmingham, where the Lord Mayor gave them a cordial welcome. Among those present at the reception were Alderman Sir Hallewell Rogers, Chairman, and Mr. G. Hampton Barber, Secretary, of the Gas Committee. After Sir Hallewell Rogers had explained the position of the undertaking, the visitors were entertained at luncheon by the Lord Mayor. A large party sat down, including Mr. Henry Hack, Engineer, and Mr. Davidson, Chemist, to the Gas Department. In the afternoon the deputation inspected the gas-works at Saltley and Nechells, and were entertained to tea by Sir Hallewell Rogers. They left Birmingham in the evening for Liverpool.

Ironmonger and Gas Company in Co-operation.

An example of how ironmongers and gas companies may co-operate to their mutual advantage is furnished by the following paragraph in the "Ironmonger" for last Saturday: "Most of our readers are aware that the ironmongers of Nottingham and those in the Hornsey district have been able to come to arrangements with the local gas suppliers, whereby the sale of gas-cookers is effected through their own showrooms. It has, however, been left to Mr. Walter Williams, of Regent's Parade, North Finchley, to go one better. The premises next to his ironmongery establishment being vacant, he approached the local Gas Company and undertook to open the same if they would meet him in the matter of supplying the stock of cookers, the sale of which he proposed to push, to their mutual benefit. That was a year ago; and we gather from Mr. Williams that he is entirely satisfied that his venture was good business. A few days ago we called at North Finchley, where cookery lectures were being given in a room in the rear of the shop by an expert lady lecturer. The front part of the premises, as well as one of the ironmongery windows, is for the time being devoted to a display of Parkinson's gas-cookers and heating-stoves—Messrs. Parkinson and W. & B. Cowan, Limited, of London and elsewhere, having secured the use of the floor and provided the lady lecturer. This arrangement is a temporary one, and extends over a period of fourteen days; for, under ordinary circumstances, Mr. Williams shows cookers manufactured by several firms whose patterns are favoured by the Southgate and District Gas Company, and, besides, he is able at any time, as we understand the arrangement, to supply stoves and cookers made by firms not usually represented in the show-room."

Bury Corporation Gas Department.

In last week's "JOURNAL" it was stated that there was the handsome profit of £7197 realized from the Bury gas undertaking for the past twelve months. There was an increase in the quantity of gas made of above 9 million cubic feet; the total quantity being just over 405¾ millions. The unaccounted-for gas was equal to 3 per cent. of the make. The statement of working shows that the net cost of gas per 1000 cubic feet sold was practically 1s. 2d.; while interest and sinking fund charges amounted to about 7½d. The income from gas and hire of meters, cookers, and boilers worked out to about 2s. 2½d. per 1000 feet. The price of gas was 1s. 11d. net for ordinary consumers and 1s. 9d. net for power purposes. The revenue from gas sold, residuals, and incidental receipts was £59,335; while the expenditure came to £40,023. This left a gross profit of £19,312, out of which £12,115 had to be provided for interest and sinking fund charges. Thus there was, as already mentioned, a net profit of £7197, one-half of which (in accordance with the statutory provisions) will be applied to the general rate, and the other half to the gas consumers. A sum of £4571 has been taken from the reserve fund to defray the cost of necessary alterations to the retaining wall at the railway siding. Capital expenditure to the extent of £3014 was incurred during the year; the total outlay on the undertaking at March 31 being £293,996.

Reduction in Price at Marple.—The question of the price charged for gas has been discussed by the Marple Urban District Council, with the result that consumers are to receive a very substantial concession. One member proposed that the rate should be reduced from 3s. 1cd. to 3s. per 1000 cubic feet in Marple, and to 3s. 6d. in Marple Bridge and other parts. But this was rejected in favour of an amendment to the effect that there should be an all-round reduction of 6d. per 1000 cubic feet. The new price will take effect as from the end of the present quarter.

Strabane New Gas-Works.—A special meeting of the Strabane Urban District Council was held recently, for the purpose of receiving a report from Mr. Charles Hunt, the Engineer for the new gas-works, with regard to his final inspection of the works. Mr. Hunt said he was quite satisfied the alterations that he suggested should be made by the Contractor had been carried out satisfactorily. The works were now completed, and from every point of view were a substantial job. The Inspector of the Local Government Board was present during his inspection, and he expressed satisfaction at the way in which everything had been carried out. There was one matter which he wished to mention—that, as regarded the loan of £15,000 advanced for the construction of the works, the final instalment would not be able to cover the extra expenditure due to certain alterations that it was imperative to carry out. In order to meet this, a further sum of £1000 would be necessary. The Council had no funds from gas revenue to meet this expenditure, owing to these having been used for other purposes. It was decided to postpone consideration of this matter.

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Important Economy as compared with other Heating Appliances.
Maximum Heating Power—Minimum of Expense.
Radiates Heat comparable to Sun Heat.
Distribution of Heat Automatic or At Will, an Appreciable Advantage upon Existing Apparatus.
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A Windfall at Lancaster.—When a list of old mayoral funds in the Lancaster Bank was being gone over, it was found that there was a sum, which with interest amounted to £127 10s. 10d., standing to the credit of the old Lancaster Gas Company, and it was decided that the bank should be asked to transfer this amount to the credit of the Gas Committee, upon the Corporation indemnifying the bank against any claims which may be made. The money, which has been lying in the bank since 1882, will be placed to the gas reserve fund.

Winding-Up of the St. Neots Water Company.—Meetings of creditors and shareholders of the Company were held on Thursday to select a Liquidator under the compulsory winding-up order recently made. The accounts show liabilities £8087, against assets £10,083, but a deficiency of £7923 as regards shareholders. The failure of the Company was attributed to the large amount of costs incurred in making unsuccessful applications for further parliamentary powers. There being a difference of opinion upon the selection of a Liquidator, the appointment will be made by the Registrar.

Driffield Gas Committee Deadlock.—The deadlock in connection with the Driffield Gas Committee still existed when the Urban District Council met last week; and it was reported that the Finance Committee had had to take the monetary part of their duties in hand, because, as the Chairman said, "if the financial obligations were not met, the creditors could appoint a receiver, and tap the revenues." Two members of the Committee tendered their resignations at this meeting; and the Council thereupon took the matter into their own hands, and passed a resolution disbanding the whole of the Committee. A new Committee of five members was then elected.

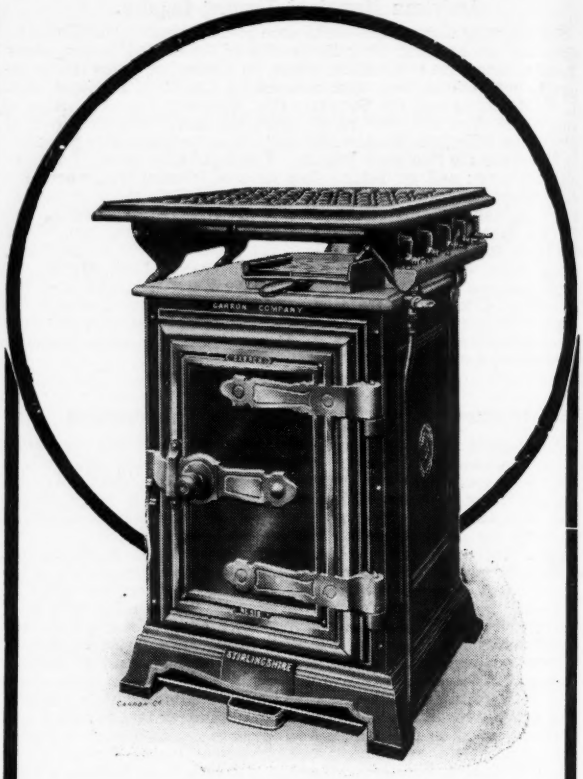
Proposed Gas-Works Extensions at Worthing.—It is rumoured that, as the result of their failure to obtain the sanction of the Board of Trade to the extension of the works on the present site, the Directors of the Worthing Gas Company are contemplating going outside the borough into Goring parish for the additional land they require. It seems, from what has transpired, that the Company have the option of purchasing several acres of land there, alongside the railway, providing the subsoil is suitable for the foundations. At the last meeting of the Parish Council, a resolution expressing the opinion that the establishment of gas-works will be highly detrimental to the district was carried by four votes to three.

Rhyl's New Water Supply.—Last Friday, the Rhyl Urban District Council brought into use their new reservoir at Llannefydd, in the Denbighshire Hills. The work has occupied nearly four years, and has cost £26,000. It was carried out by the Council's Water Engineer (Mr. Leonard G. Hall, Assoc.M.Inst.C.E.) without the aid of a contractor; work being found for the local unemployed. The opening ceremony was performed by Mr. T. Whitley, the Chairman of the Water Committee, who was presented with a silver cup by his colleagues and the officials. The reservoir supplies the large district of Rhyl and the towns of Abergele, Rhuddlan, and St. Asaph. The gathering-ground of 900 acres is under the control of the Council.

Tavistock Public Lighting.—The decision of the Tavistock Urban District Council not to have the street-lamps lighted for three weeks before and three weeks after Midsummer, has given rise to a strong feeling of resentment in the town. On Friday there was a striking demonstration. At ten o'clock a crowd assembled in Bedford Square, many having lighted lanterns, and outside the Constitutional Club there was an arrangement of lights representing the crescent moon. Earlier in the evening, a special meeting of the Council was held, when the resolution ordering the discontinuance of public lighting was rescinded, and one was unanimously passed instructing the Gas Company to have the lamps lighted every night according to the original contract, as far as the lanterns available will allow.

Withnell Gas-Works Scheme.—This scheme is now complete, and little remains to be done beyond the turning of the gas into the mains. The retorts were fired up on Monday last week; and it was expected that gas would be turned into the holder on Saturday. About 200 dwelling-houses have been connected with the mains, and two large firms will have their premises lighted by gas. The township being a very extensive one, has necessitated a long line of pipes, extending as far as Abbey Village, where some of the cottages are at present lighted by electricity, which is stated not to have been satisfactory. It is expected that the price to ordinary consumers will be 3s. 6d. per 1000 cubic feet. At the meeting of the Urban District Council on Thursday, Mr. A. Towers (the Chairman of the Gas Committee) suggested that there should be a formal inauguration of the scheme. The Council's Engineer (Mr. Isaac Carr, M.Inst.C.E.) was authorized to obtain the services of Mr. G. Cliffe, of the Sutton and Hooton Gas Company, to superintend the gas-works for such a term as might be deemed necessary when gas was turned into the mains.

Gainsborough Gas Supply.—The profit and loss account of the Gainsborough Gas Department for the year ended March 31 shows total receipts £14,574, and expenditure £13,528; there being a profit of £1046. The quantity of coal carbonized was 7522 tons, a reduction on the previous year of 293 tons; the total quantity of gas made being 83,288,000 cubic feet, as against 81,454,000 feet—showing an increase of 1,834,000 feet. The make of gas per ton carbonized was 11,072 cubic feet, as against 10,422 feet. In 1899—the last year under the old Gas Company's working—the make was 8854 cubic feet per ton. Although the make per ton has increased, through the careful attention of the Manager (Mr. J. Baldwin), the quality of the gas, as tested at the works, is considerably above the parliamentary standard. Receipts from residual products show an improvement on the previous year. Gas-cookers continue to increase in popularity; the number in use at present being 432. The number of gas consumers is 1976, showing an increase of 174 as compared with the previous year. The Council have resolved to add to the reserve fund a second sum of £750, and also to give more relief to consumers in the way of discount. At present this is 2½ per cent.; and the Council have agreed to make it 5 per cent., to take effect on the present quarter's accounts. The Council considered the statement very satisfactory, and passed a resolution: That the accounts as presented be accepted and entered on the minutes, with an expression of gratification at the results of the year's working, and their entire satisfaction with the management.



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Gas Explosion in South Lambeth.—A somewhat serious gas explosion took place in Portland Place, South Lambeth, on Friday, by which a public-house bar was wrecked, and several persons received injuries. It is stated that three passers-by—a man and two women—were so much hurt by flying pieces of glass as to render necessary their removal to St. Thomas's Hospital.

Messina Water Supply.—Messina has now an excellent supply of water. A new aqueduct was brought into use last year, and conducts water from Bocche del Niceto to a reservoir at Fort Gonzaga, which has a capacity of 1,320,000 gallons, and is the largest of the four reservoirs. The other three are Noviziato, Torre Vittoria, and Trapani. The aqueduct is about 15 miles in length and has four large syphons—viz., Pioppo, Reale, Lupo, and Camaro; 11 of the 15 miles consist of tunnels, the chief one being the Grioli, with a watercourse of 1312 yards. The next largest is Camaro, which measures 874 yards. At present the daily supply is 1,496,000 gallons. Later this will be increased by 220,000 gallons. The pipes are capable of conveying 3,960,000 gallons a day. The aqueduct cost about £160,000.

Alexandria Water Company, Limited.—The Directors of this Company state in their report for the year ended March 31 last that the total receipts were £80,481, being an increase of £7106 over the previous year, and that the working expenses were higher by £2715. There had been written off as depreciation of works £2500, which, together with £30,550 already written off, made a total depreciation of £33,050. A sum of £1600 had also been written off materials in stock and furniture. The net balance on the profit and loss account amounted to £41,035; and it is recommended that a final dividend of 7s. 6d. per share should be declared—making, with the interim dividend paid, 10 per cent. for the year. The surplus of £3535 is divisible in equal portions between the shareholders and the Municipality; thus enabling a further distribution of 6d. per share to be made to the former.

The Midsomer Norton (Somerset) Gas Company have placed an order with Messrs. Willey and Co., Limited, of Exeter, for a new single-lift gasholder and steel tank, to be erected during the coming summer.

Tice's Gas Apparatus Company, Limited, has been registered with a capital of £1000, in £1 shares, to acquire the business carried on at Wellington Chambers, London, as the Automatic Gas-Meter Governor Company, and adopt an agreement with B. R. Beale, W. Tice, J. E. Sibley, and E. W. Tapper. There will be no initial public issue.

Messrs. Biggs, Wall, and Co. have in hand several contracts for sulphate of ammonia plant; among them being a 1-ton plant for Haywards Heath, plant of similar capacity for St. Helen's, Isle of Wight, and a solid lead saturator for Treforest. They have besides several other contracts for carburettors, &c., and for extensive alterations to the Abingdon Gas Company's sulphate plant.

Mr. E. Cecil Watkins writes that the partnership heretofore existing between Mr. Swallow and himself, carrying on business as Messrs. W. Neill and Son, at St. Helens Junction, has been dissolved (as from April 30 last), under an arrangement by which Mr. Swallow ceases to be a member of the firm. All debts due to and owing by the late firm to April 30 will be received and paid by Mr. Watkins; and the business will in future be carried on by him under the same style as before.

The latest project is a floating exhibition of British manufactures, which is to visit about 40 different ports of commercial importance in various parts of the world. It is proposed to charter a large mail steamer, fit her out with samples of goods manufactured by the best industrial firms, and send her on a voyage round the world. At each port there will be a formal opening of the exhibition on the ship. We wonder whether there will be any British-made gas appliances among the exhibits.

On Thursday, the 7th inst., the employees at the Dawsholm and Temple stations of the Glasgow Corporation Gas Department had their annual excursion, when upwards of 500 of the workmen, with their wives and families, journeyed to Ayr. The weather being splendid, the outing was greatly enjoyed. During the afternoon, the usual sports were held on the Public Green, while the brass band accompanying the excursion performed a selection of music in the band stand. On their arrival home, the party proceeded to the works, where Mr. A. M. MacLeod, the Station Manager, presented prizes to the respective winners.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER-WORKS MANAGER. "B.," c/o Barker & Sons, London.
REPRESENTATIVE. 385, Brown's Advertising Offices.
ACCOUNTANT-CLERK. Devizes Gas and Water Department. Applications by June 25.
WATER FITTER. Mid Kent Water Company.

Situations, &c., Wanted.

GAS FITTER, &c. W. H., Essex Road, N.
SECRETARIAL WORK. Griffith, Queen Victoria Street.

Gas Manufacture Correspondence Classes.

SECRETARY. Cambridge.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. June 26.
ELSTREE, &c., GAS COMPANY. June 26.
SOUTH SUBURBAN GAS COMPANY. June 26.
WOKING WATER AND GAS COMPANY. June 26.

TENDERS FOR

Carbon.

HALIFAX GAS DEPARTMENT. Tenders by July 3.

Coal and Cannel.

BELPER GAS COMPANY. Tenders by June 22.
CLONMEL GAS DEPARTMENT. Tenders by June 26.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by June 27.
EXMOUTH GAS COMPANY. Tenders by June 30.
KESWICK GAS COMPANY. Tenders by June 20.
MILLOM GAS DEPARTMENT. Tenders by July 3.
NEW MILLS GAS DEPARTMENT. Tenders by June 25.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by June 27.
SOUTH OXFORDSHIRE WATER AND GAS COMPANY. Tenders by July 2.
SOWERBY BRIDGE GAS DEPARTMENT. Tenders by June 25.
STOKE-ON-TRENT GAS DEPARTMENT. Tenders by June 28.
TEIGNMOUTH GAS DEPARTMENT. Tenders by July 2.
WINSFORD GAS DEPARTMENT. Tenders by July 3.

Coke.

LEIGH-ON-SEA GAS DEPARTMENT. Tenders by June 27.
MALVERN GAS DEPARTMENT. Tenders by June 25.

Brass Lamp Fittings, Main Cocks, &c.

HALIFAX GAS DEPARTMENT. Tenders by July 3.

Lime.

HALIFAX GAS DEPARTMENT. Tenders by July 3.

Oxide of Iron (New and Spent).

EXETER GAS COMPANY.
HALIFAX GAS DEPARTMENT. Tenders by July 3.

Retort Benches.

NEWTON-IN-MAKERFIELD GAS DEPARTMENT. Tenders by June 30.

Sulphuric Acid.

HALIFAX GAS DEPARTMENT. Tenders by July 3.

Tar and Liquor, &c.

ATHERTON GAS DEPARTMENT. Tenders by June 26.
BRIDGEWATER COLLIERIES COKE WORKS. Tenders by June 25.
KESWICK GAS COMPANY. Tenders by June 20.
NEWARK GAS COMPANY. Tenders by June 30.
NEW MILLS GAS DEPARTMENT. Tenders by June 25.
READING GAS COMPANY. Tenders by June 2[illegible].

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS ELLAND.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, West Moor Chemical Works, Killingworth, near NEWCASTLE-ON-TYNE.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas-Works Plant, Roofs, Bridges, &c., undertaken by Contract or otherwise.
FREDERICK BOYALL, 31, Regent's ROW, DALSTON, N.E.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

GAS OILS.
MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

TEMPERLEY TRANSPORTERS
FOR Rapid and Economical Handling of Coal and Coke in Gas-Works.
Next Illustrated Advertisement will appear on June 26.
TEMPERLEY TRANSPORTER COMPANY,
72, BISHOPSGATE STREET WITHIN, LONDON, E.C.
Telephone: 365 LONDON WALL. Telegrams: "TRANSUMO."

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, POLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

THE KEITH LIGHT.
OVER 3000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

GAS MANUFACTURE.
CORRESPONDENCE Classes now starting in this subject. Fees low.
Apply SECRETARY, 26, Green Street, CAMBRIDGE.

WANTED, immediately, Water-Fitter.
Must be used to ground work.
Apply, with Particulars, to the MID-KENT WATER COMPANY, SNODLAND.

ARTHUR L. GRIFFITH (Secretary of the Society of British Gas Industries), of 46, Queen Victoria Street, London, E.C., is now at liberty to undertake SECRETARIAL WORK. Has good Office with Board Room. Charges Moderate.

GAS-FITTER wants Job. Used to Service Laying and Fixing all kinds Public Street-Lamps, Posts, Brackets, and High-Pressure Incandescent Lamps, and Repair of same. Town or Country.
Address, W. H., 70, Elmore Street, Essex Road, N.

WATER-WORKS Manager—Wanted, an Experienced Water-Works MANAGER for a Suburban Water-Works near London. Highest References required.
Address, by letter only, "B" care of MESSRS. CHARLES BARKER & SONS, 8, Birchin Lane, LONDON, E.C.

WANTED, by First-Class Firm of Gas Cooking and Heating Appliance Manufacturers, REPRESENTATIVE for the Lancashire and Yorkshire District. Must have Connection, and be accustomed to handling these Goods.
State Experience, Salary, and Commission required, to Box 385, T. B. BROWNE'S ADVERTISING OFFICES, 163, Queen Victoria Street, LONDON.

DEVIZES GAS AND WATER WORKS.
THE Gas and Water Committee of the Devizes Urban District Council require the services of an Experienced ACCOUNTANT CLERK, who will be required to devote the whole of his time to the keeping of the Gas and Water Accounts in the Office of these Departments under the direction of the Manager. Salary at the rate of 35s. per week, with Three Months notice to terminate the Engagement.
All Applications for the above must be addressed to the Chairman of the Committee, and sent to me not later than Four o'clock in the afternoon of June 25 next.
J. W. HOLLOWAY,
Manager.
Gas-Works, Devizes.

WANTED, Copper Scrap, 72s.; Brass, 48s.; Zinc, 16s.; Lead Ashes, 8s. Also old Wet Gas-Meters bought.
ROSSE WORKS, Leeds Road, BRADFORD.

PURIFIERS for Sale. Splendid set of Four 10-feet square Boxes, planed joints, new Covers. Re-erected cheap for immediate sale.
Also sets of 12-feet, 16-feet, 20-feet, and 30-feet square PURIFIERS, erected Complete and Perfect.
FIRTH BLAKELEY, Thornhill, DEWSBURY.

GASHOLDERS—5000 and 10,000 feet Capacity. New Steel TANKS for same. Ready for delivery. Erected complete. Cheap if sold promptly. Larger sizes in stock or progress. All other Gas Apparatus Manufactured or Supplied.
FIRTH BLAKELEY COMPANY, Gas Engineers, Thornhill, DEWSBURY.

FOR SALE, Cheap—24-inch Specials, Bends, Tees, Elbows, and 24-inch Valves. All in good condition. Makers, Newton, Chambers, & Co.
Apply T. DUXBURY AND CO., MANCHESTER.

"WOODITE," a Superior Substitute for RUBBER, LEATHER, &c., for Steam Joints, Gauge-Glass Rings. New GLAZIERS' DIAMONDS and GLASS CUTTERS.
Write to JAMES READ, 245, Whitehorse Lane, South Norwood, LONDON, S.E.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

LEIGH-ON-SEA URBAN DISTRICT COUNCIL.
THE Council have for Sale 75 Chaldron of GAS COKE, and invite TENDERS for the purchase of the same, delivered free on the Council's Gas-Works Wharf, Leigh-on-Sea.
Tenders to be received by the undersigned not later than Wednesday, the 27th inst.
W. CARLYLE CROASDELL,
Clerk to the Council.
Council Offices, Leigh-on-Sea,
June 14, 1906.

SOUTH OXFORDSHIRE WATER AND GAS COMPANY.
STEAM COAL.
THE Directors of this Company invite TENDERS for the supply of about 600 Tons of SMOKELESS STEAM COAL. Delivery, about 50 Tons per Month to Goring-on-Thames (G.W. Rly.).
Tenders to the Secretary on or before July 2, 1906.
F. C. ROBUS, F.C.I.S.,
Secretary.
20, Bucklersbury,
London, E.C., June 18, 1906.

GAS TAR.
THE Urban District Council of Ather-ton invite TENDERS for the purchase of the TAR produced at their Gas-Works during Twelve Months from the 30th of June inst.
Probable quantity, about 450 Tons.
Sealed Tenders to be delivered to the undersigned on or before Tuesday, the 26th inst.
D. SCHOFIELD,
Clerk.

THE Directors of the Keswick Gas Company invite TENDERS for the supply of 1800 Tons of best screened GAS COAL or NUTS, to be delivered at Keswick Railway Station between the 1st day of July, 1906, and the 30th of June, 1907, in such quantities and at such times as may be required.
Tenders, stating price per ton, endorsed "Tenders for Coal," to be sent to the undersigned not later than the 20th inst.
The Directors do not bind themselves to accept the lowest or any Tender.
No Form of Tender supplied.
J. H. BRODIE,
Secretary.
Main Street, Keswick,
June 12, 1906.

THE Directors of the Keswick Gas Company invite TENDERS for their surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 30th inst., at per ton delivered into Contractors' Tanks at Keswick Railway Station.
Sealed Tenders, endorsed "Tenders for Tar or Liquor," will be received by the undersigned on or before Wednesday, the 20th inst.; but the Directors do not bind themselves to accept the highest or any Tender.
Forms of Tender are not supplied.
J. H. BRODIE,
Secretary.
Main Street, Keswick,
June 12, 1906.

TEIGNMOUTH URBAN DISTRICT COUNCIL.
THE Gas Committee of the above Council invite TENDERS for the supply of 3400 Tons of best Durham or other good GAS COAL, screened or unscreened. Same to be supplied to the requirements of the Council between the 31st day of July, 1906, and the 30th day of June, 1907. The Coal must be fresh-wrought, and free from all impurities.
No special Tender Form will be issued.
Tenders must be accompanied by a full description and practical working Analysis of the Coals quoted, and may be f.o.b., c.i.f., Teignmouth Harbour, or f.o.r. Teignmouth Railway Station.
Sealed Tenders, endorsed "Gas Coals," to be sent to the undersigned not later than Monday, the 2nd day of July, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
J. ALEX. GRAY,
Gas Manager.
Gas-Works, Teignmouth,
June 9, 1906.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)
TENDERS FOR CANNEL AND COAL.
THE Gas Committee are prepared to receive TENDERS for the supply and delivery of 14,000 Tons of best Screened GAS COALS and 1200 Tons of best CANNEL COALS, or such quantities as may be required for the Gas-Works at Sowerby Bridge and Luddenden Foot during the period of Twelve Months between the 1st day of July, 1906, and the 30th day of June, 1907.
Tenders will be received for the whole or any portion of the above quantity.
Specifications, Forms of Tender, and all Information can be obtained on application to the Engineer, Mr. A. W. Bissell, Gas-Works, Sowerby Bridge.
The Gas Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, to be delivered not later than Monday morning, June 25, 1906, and endorsed "Tender for Coal" or "Cannel," to
R. W. EVANS,
Solicitor and Clerk to the Council.
Commercial Bank Chambers,
Halifax.

URBAN DISTRICT COUNCIL OF WINSFORD.
THE above Council are prepared to receive TENDERS for the supply of CANNEL and best Screened GAS COAL, to be delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the L. & N.W. Rly., or at the Council's Wharf on the River Weaver at Winsford. The material is required for a term of Twelve Months ending the 1st of August, 1907.
The probable quantities required will be about 300 Tons of Cannel and about 1700 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of reasonably increasing or decreasing the quantities named. The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of the Contract.
Sealed Tenders, stating price per Ton delivered as above, are to be received by the undersigned on or before the 3rd of July, 1906, and endorsed "Gas Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender and further Particulars may be had on application to the Gas Manager, F. Sidwell, Winsford; or from
JNO. H. COOKE,
Clerk to the Council.
Council Offices, Russell Street,
Winsford, Cheshire,
June 13, 1906.

EXETER GASLIGHT AND COKE COMPANY.

OXIDE OF IRON.

TENDERS are invited for the supply of 150 Tons of OXIDE OF IRON Purifying Material delivered alongside Basin Gas-Works Wharf, c.i.f. The moisture not to exceed 35 per cent.

Also for the Purchase of 300 to 350 Tons of SPENT OXIDE delivered f.o.b. alongside Wharf.

The lowest or any Tender will not necessarily be accepted.

W. A. PADFIELD,
Engineer.

Gas Offices, Exeter,
June 7, 1906.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for a Twelve Months' supply of GAS COAL.

Particulars may be obtained from the undersigned, by whom Tenders will be received until Wednesday, the 27th inst.

JAMES BRADDOCK,
Manager and Secretary.

Gas Offices, Radcliffe,
June 13, 1906.

READING GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Reading Gas Com- pany invite TENDERS for the purchase of their surplus Coal-Gas and Carburetted Water-Gas TAR for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on application to the Engineer and Manager, Mr. Douglas H. Helps, Assoc.M.Inst.C.E.

Under the Conditions of the Contract, no allowance will be made for any Water that may be found in the Tar.

Railway communication direct to the Works.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Monday, June 25, 1906.

The Directors do not bind themselves to accept the highest or any Tender.

A. CANNING WILLIAMS,
Secretary.

159, Friar Street,
Reading, June 6, 1906.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply at their Works, situate near the Railway Station, Belper, of 2000 Tons (more or less) of GAS COAL (part in the Gas Company's own waggons); also about 200 Tons (more or less) of CANNEL COAL, to be delivered at such times and in such quantities as the Directors or their authorized servants shall from time to time order.

Sealed Tenders, stating Price per Ton, and Information as to the quality and quantity of Gas the Coal is estimated to produce, also as to where the same is now in use, to be sent to the undersigned on or before Friday the 22nd of June.

The Directors do not bind themselves to accept the lowest or any Tender, nor to take the whole of the above quantities of Coal or Cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, June 12, 1903.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the Supply of (1) BRASS LAMP FITTINGS, (2) BRASS MAIN COCKS and UNIONS, (3) OXIDE OF IRON, (4) SULPHURIC ACID, (5) LIME; and for the Purchase of (1) GAS CARBON, (2) SPENT OXIDE OF IRON, during the Twelve Months ending the 30th of June, 1907.

Forms of Tender and further Information may be obtained on application to Mr. J. Wilkinson, F.C.S., Engineer, Gas-Works, Halifax, on and after Monday, the 25th of June, 1906.

Tenders, properly endorsed, must be sent to the undersigned on or before Tuesday, the 3rd of July.

The persons whose Tenders are accepted for the supply of the above-mentioned Articles will be required to observe the Fair Contracts Clauses adopted by the Corporation.

The Committee do not bind themselves to accept any Tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the supply of 4000 to 5000 Tons of Best GAS COAL (screened or unscreened), to be delivered in such quantities and at such times as may be required from the 1st of September, 1906, to the 31st of August, 1907, and to weigh 20 cwts. to the Ton over the Gas Company's or Dock Company's Weighbridge, the Coal to be fresh wrought, dry, free from Hards, Smudge, Shale, and Pyrites.

Tenders to be accompanied by Practical Working Analysis.

Prices may be quoted c.i.f. or f.o.b. Exmouth Docks, or f.o.r. Exmouth Railway Station (L. & S.W. Rly.).

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Saturday, the 30th day of June, 1906.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided.

JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
June 12, 1906.

STOKE-UPON-TRENT CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation Gas Committee of Stoke-upon-Trent invite TENDERS for the supply of 14,000 Tons of GAS COAL.

Specification and Form of Tender may be obtained on application to the undersigned, or at the Gas Offices.

Tenders to be sent in not later than Twelve o'clock noon on the 28th day of June, 1906, addressed to F. Geen, Esq., J.P., Chairman of the Gas Committee, Stoke-upon-Trent, and endorsed "Tender for Gas Coal."

WM. PRINCE,
Engineer and Manager.

Gas Offices, Stoke-upon-Trent,
June 14, 1906.

MILLOM URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply of 1200 to 2500 Tons of GAS COAL at such times and in such quantities as the Council may require during Twelve Months from the 1st of August next.

The Coal must be of the best quality.

Full Particulars of the Coal, Colliery, and Working Analysis to be given.

State Price per Ton delivered free at Millom Station (Furness Railway).

Sealed Tenders, on Forms which can be had on application, endorsed "Tender for Coal," to be sent in to me not later than the 3rd of July prox.

The Council will not be bound to accept the lowest or any Tender.

W. T. LAWRENCE,
Clerk.

Millom, June 11, 1906.

COLWYN BAY AND COLWYN URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery at Colwyn Bay Station of about 5500 Tons (more or less) of Best Screened GAS COAL during the Twelve Months ending June 30, 1907.

Sealed Tenders, endorsed "Tender for Gas Coal," to be addressed "Chairman of the Gas Committee," to be delivered at the Gas Offices, Colwyn Bay, not later than Wednesday, June 27.

The Committee do not bind themselves to accept the lowest or any Tender.

N.B.—No Tender Forms will be sent out.

JAS. C. PENNINGTON,
Engineer and Manager.

Gas Offices, Colwyn Bay,
June 7, 1906.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, &c.

THE New Mills Urban District Council invite TENDERS for the supply of 2500 Tons of best GAS COAL and 200 Tons of CANNEL for the Year ending the 30th of June, 1907.

Forms of Tender and full Particulars may be had on application to the Gas Manager.

TENDERS are also invited for the purchase of the surplus TAR and LIQUOR for One Year ending June 30, 1907.

Tenders, properly endorsed, to be sent to me the undersigned not later than June 25, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

J. POLLITT,
Clerk.

Town Hall, New Mills,
June 6, 1906.

NEWARK GAS COMPANY.

TAR AND LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for the Purchase of the LIQUOR and Surplus TAR produced at their Works, f.o.r. Great Northern or Midland Railways, in Purchasers' Tank-Waggons, for One Year from the 1st of July, 1906.

Terms, Cash Monthly.

Separate Tenders, each marked on the outside "Tender for Tar or Liquor," as the case may be, to be sent in to the undersigned on or before June 30, 1906.

The Directors do not bind themselves to accept the highest or any Tender.

F. B. FOOTTIT,
Secretary.

June 11, 1906.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Tar pro- duced at the above Works for a period of Six or Twelve Months from the 1st of July, 1906, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding, Little Hulton Mineral Branch of the London and North-Western Railway.

The estimated quantity is about 2600 Tons per annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Offices, 4, Chapel Walks, MANCHESTER, not later than the 25th of June.

Manchester, May 29, 1906.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 16th inst., and RE-OPENED on the 2nd of July, 1906.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane, W.C.,
June 15, 1906.

CORPORATION OF CLONMEL.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above-named Corporation are prepared to receive and consider TENDERS for the supply of 3000 Tons of good Durham or Lancashire GAS COAL. Delivery in Waterford, to extend over the period from the acceptance of the Tender to the 30th of June, 1907, and to be in such quantities as shall be required from time to time.

Tenders to state prices both by Steamer and Sailer, and to be addressed to Thomas P. Morrissey, Esq., Alderman, J.P., Chairman of the Committee, Gas Offices, Clonmel, by the 26th of June, 1906.

No Forms of Tender are issued.

Further Information will be supplied by the Secretary.

MALVERN URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

COKE.

TENDERS are invited for the purchase of 3000 Tons of surplus COKE, to be delivered Free on Rail, Gas-Works Siding, Malvern Links (Great Western Railway), during a Year from the 1st of July, 1906.

Conditions and further Particulars can be had from W. J. Rendell Baker, Engineer and Manager.

Tenders to be delivered to the undersigned not later than Twelve o'clock, on Monday, the 25th of June, 1906.

H. L. WHATLEY,
Clerk to the Council.

Council Offices, Malvern,
June 12, 1906.

NEWT N-IN-MAKERFIELD URBAN DISTRICT COUNCIL.

TENDERS FOR RETORT-BENCHES.

THE above Council invite Tenders for the Erection of Two Settings of RETORTS, with Regenerative Furnaces.

Drawings may be seen, and Specifications obtained, on application to the Gas Engineer, Mr. Arthur Bowes, Assoc.M.Inst.C.E.

Tenders, endorsed "Tender for Retort-Benches," addressed to the Chairman of the Gas Committee, must be delivered at my Office not later than Saturday, the 30th of June inst.

The Council do not bind themselves to accept the lowest or any Tender.

C. COLE,
Clerk to the Council.

Town Hall, Earlestown,
Lancashire, June 14, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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Re Mr. C. F. Wardell deceased and others.

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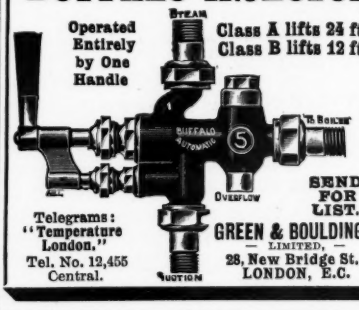

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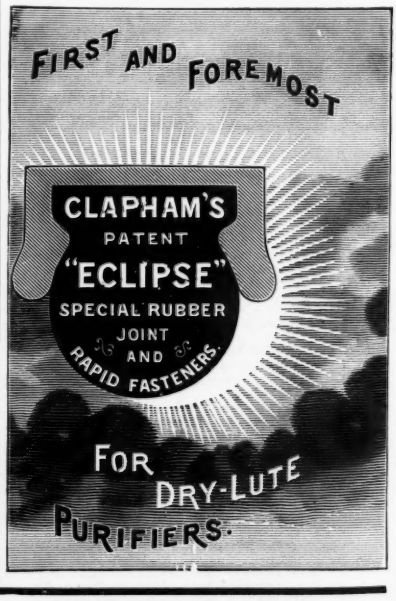

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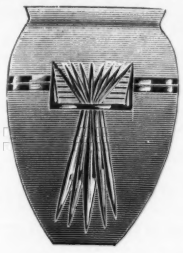

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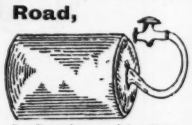

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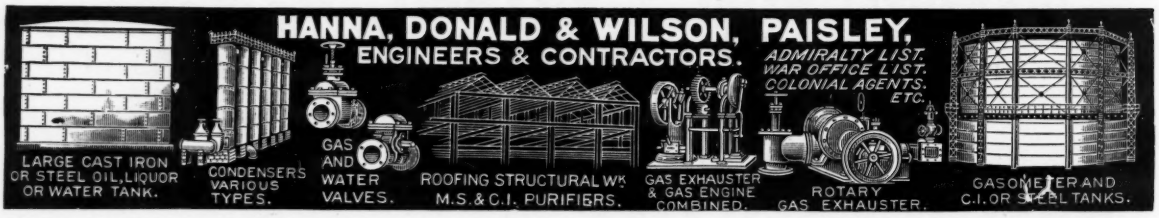
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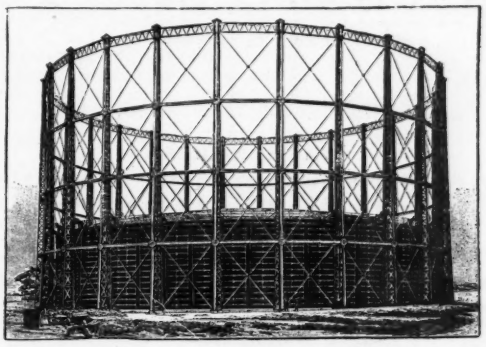

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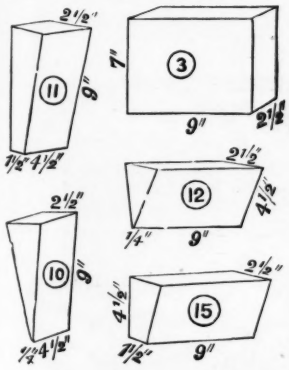

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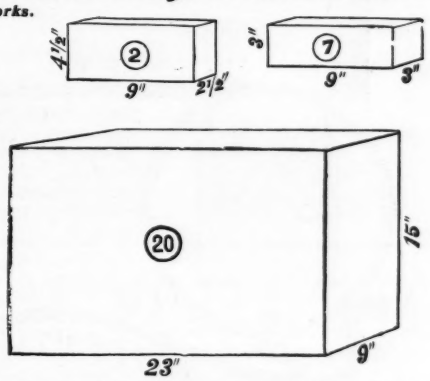

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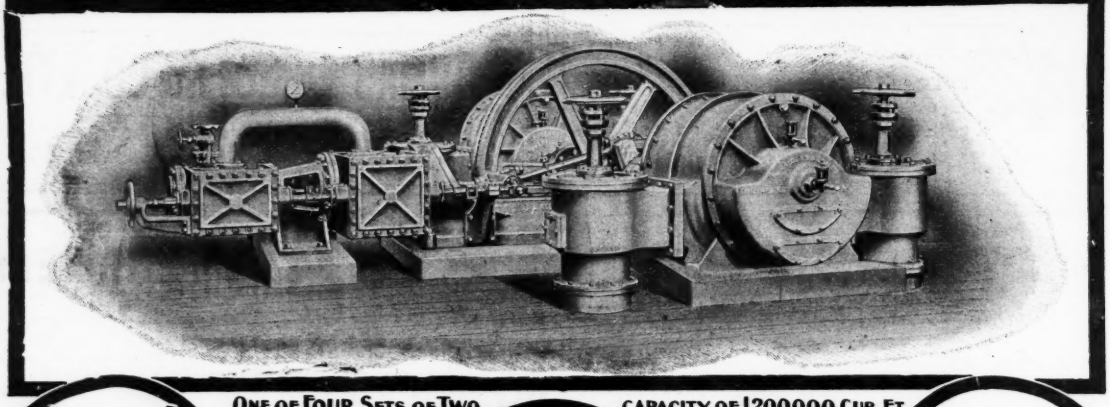

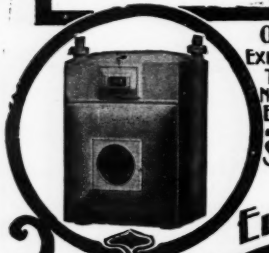

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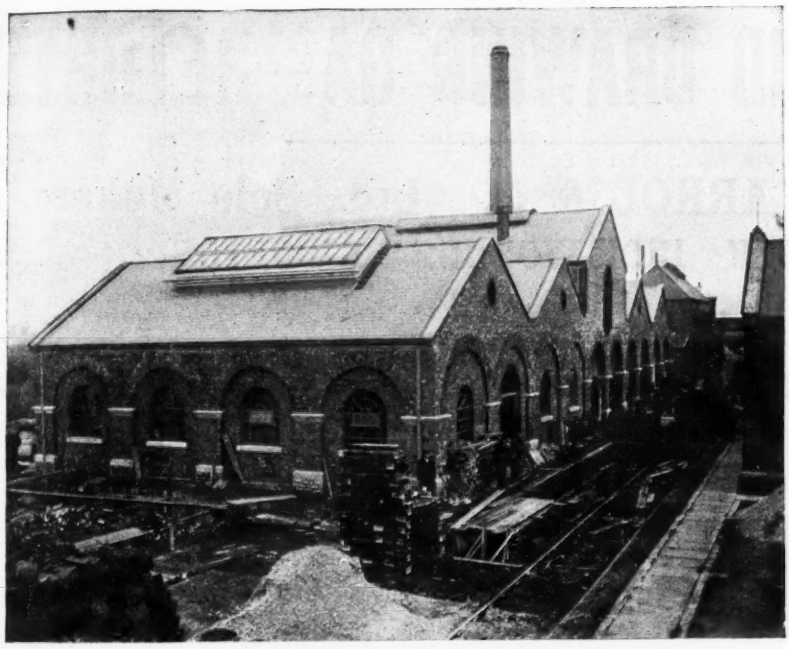

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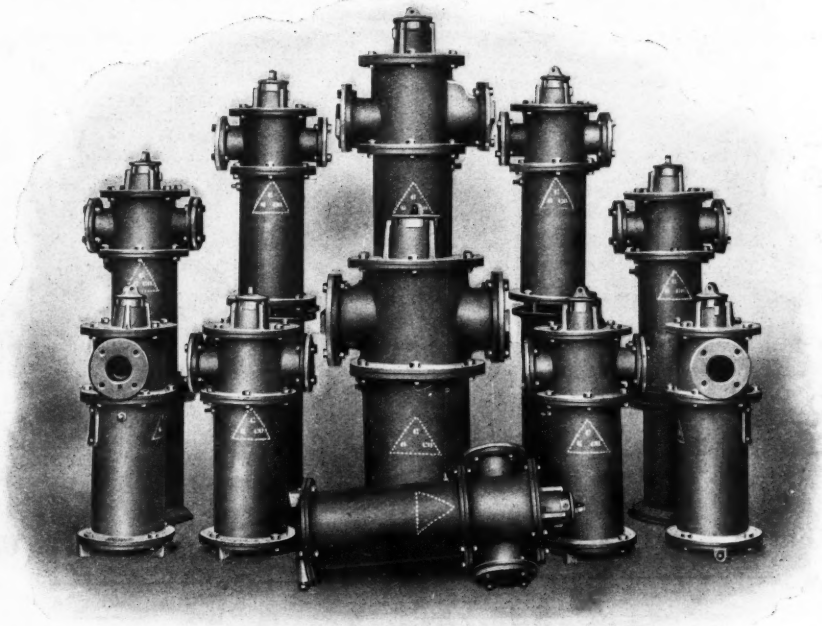

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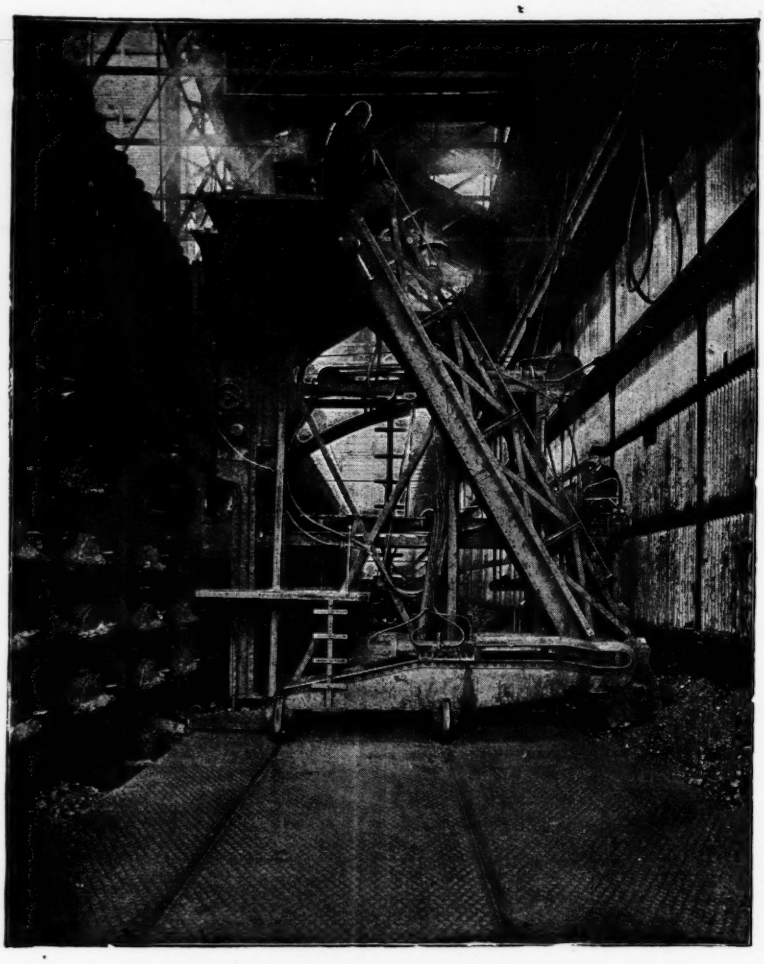

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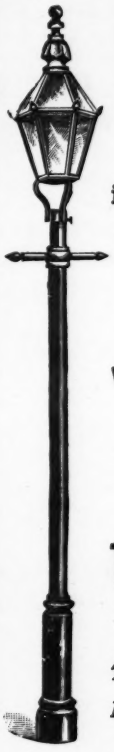

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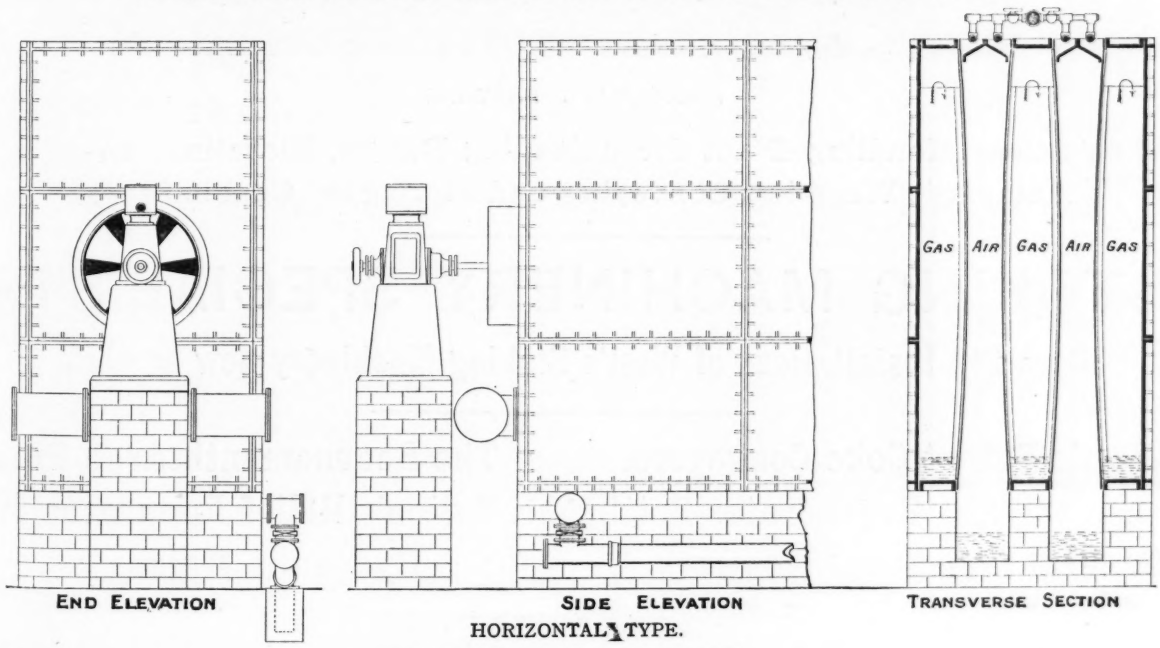

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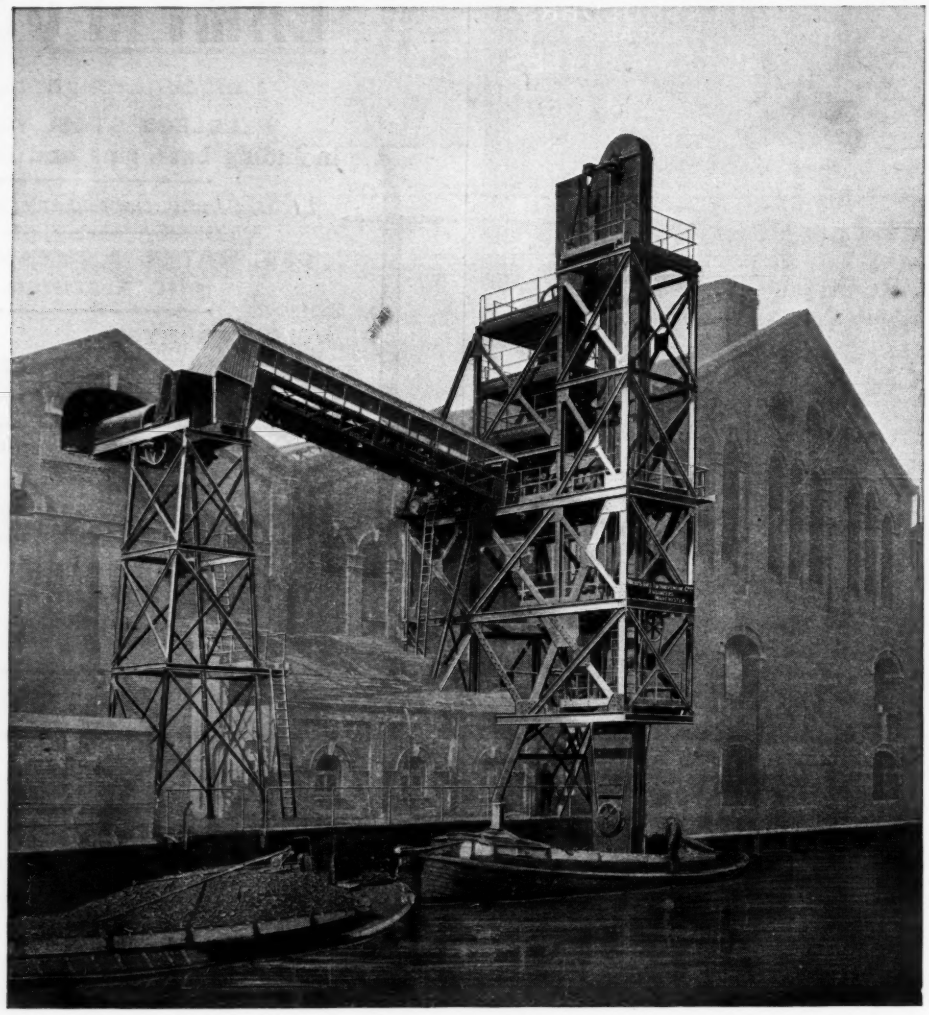

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